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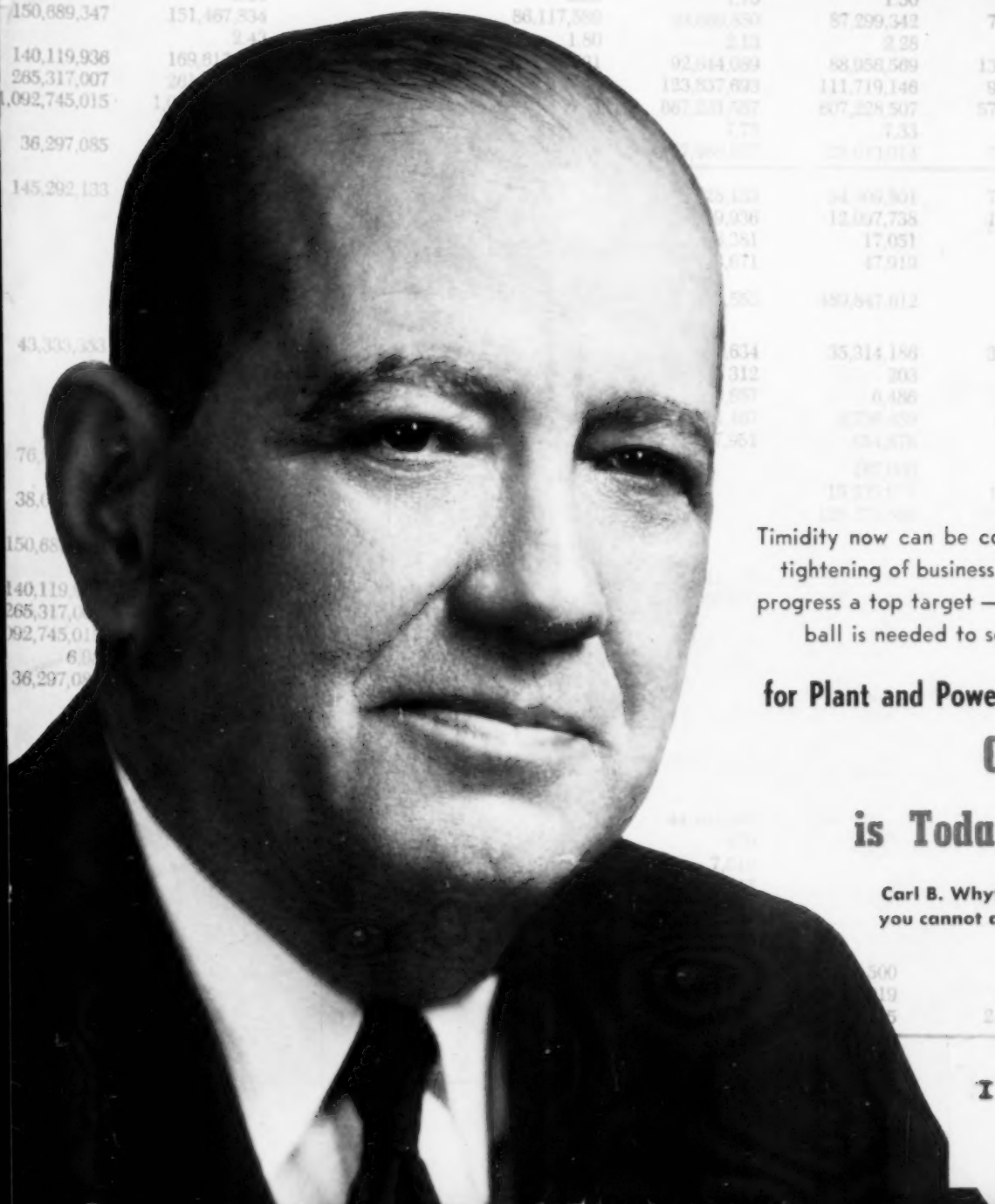
In this issue: — over 60 reports of technical developments in plant and power services

OCTOBER 1958

POWER INDUSTRY

PLANT & POWER SERVICES



Timidity now can be costly. The recent tightening of business makes competitive progress a top target — and no crystal ball is needed to see that . . .

for Plant and Power Services Facilities

Capital Improvement is Today's Biggest Bargain

Carl B. Whyte, president of Procon Inc., tells why you cannot afford to simply tighten your belt and ride out the recession — page 14

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Bailey Controls for Combustion, Feed Water and Steam Temperature at the St. Clair Power Plant of Detroit Edison Company. The FPC reported a 1956 heat rate at St. Clair of 9,200 Btu per kwhr, making it the sixth most efficient plant in the United States.

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Take the top six on the Federal Power Commission's heat rate report. All use Bailey Meters and Controls. Five of the six chose Bailey *exclusively!*

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***6 MOST EFFICIENT PLANTS—1956 Heat Rates Reported by FPC**

	Btu/kwhr	Meters	Combustion Control	Feed Water Control	Supht. Control
1. Tanners Creek (Indiana and Michigan Electric Company)	9,106	B	B	B	B
2. Kanawha River (Appalachian Electric Power Company)	9,115	B	B	B	B
3. Kyger Creek (The Ohio Power Company)	9,176	B		B	B
4. Muskingum River (The Ohio Power Company)	9,176	B	B	B	B
5. Clifty Creek (Indiana-Kentucky Electric Company)	9,200	B	B	B	B
6. St. Clair (The Detroit Edison Company)	9,200	B	B	B	B

A140-1

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Oct. 9-10: 21st Annual ASME-AIME Joint Solid Fuels Conference; Hotel Chamberlin, Old Point Comfort, Va.

Oct. 13-15: American Gas Association Annual Convention; Atlantic City, N. J.

Oct. 13-15: ASME-ASLE Lubrication Conference; Statler Hotel, Los Angeles, Calif.

Oct. 13-17: American Society of Civil Engineers; Hotel Statler, New York, N. Y.

Oct. 15-16: Second Energy Resources Conference; Denver, Colo.

Oct. 21-22: Purchasing Agents Association of Chicago; Purchasing Workshop; Illinois Institute of Technology — Dept. of Business & Economics — 33rd & State St., Chicago, Ill.

Oct. 27-30: Metallurgical Society of AIME, Fall Meeting; Carter Hotel, Cleveland, Ohio.

Nov. 11-13: National Association of Refrigerating Engineers Inc.; Kenilworth Hotel, Miami Beach, Fla.

Nov. 18-20: American Standards Association; Roosevelt Hotel, New York, N. Y.

Nov. 20-21: ASCE Conference on Electronic Computation; Kansas City, Mo.

Dec. 1-3: American Society of Refrigerating Engineers; Roosevelt Hotel, New Orleans, La.

Dec. 1-4: National Warm Air Heating and Air Conditioning Association; Cleveland, Ohio.

Dec. 1-5: ASME 23rd National Exposition of Power and Mechanical Engineering; New York Coliseum, New York, N. Y.

Jan. 26-29: ASHAE 65th Annual Meeting; Commercial Museum, Philadelphia, Pa.

Jan. 26-29: 14th International Heating & Air-Conditioning Exposition; Convention Hall, Philadelphia, Pa.

Apr. 5-9: Edison Electric Institute, Annual Convention; New Orleans, La.

Apr. 29-May 4: Oil-Heat Institute of America, Inc; Seattle, Wash.

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PRESIDENT

Dear Reader . . .

What does this say to you ?

POWER
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Those words, Plant and Power Services, tell you that POWER INDUSTRY devotes its editorial efforts solely and completely to serving you key men responsible for these activities wherever they are required ... in all kinds of industry, in utilities, in public and private institutions, schools, hospitals, etc.

For our editors understand your function -- recognize you as the responsible men who create and maintain the environment, and provide the facilities, necessary to effective operation of all types of plants, no matter what products or services your plants produce.

A single editorial purpose . . .

This singleness of purpose, and this clear-cut aim, direct POWER INDUSTRY's editors solely to editorial articles that can be of maximum helpfulness to you, in the discharge of your responsibilities.

"A trip through other plants . . ."

In this issue, as in every issue of POWER INDUSTRY, you will find news of latest developments from plants of all kinds ... all dealing with plant and power services operations and problems.

We like to think of each issue as "another trip through other plants" ... observing the best of improved practices, checking the latest advances in new pieces of equipment, new products, new materials. Here, in POWER INDUSTRY's pages, you take that trip ... the trip you've long promised to yourself ... seeing, learning, getting new ideas of highest interest and greatest help to you on your job.

(over)

Yes, "hot subjects" too. . .

And of course you'll want to read the lead articles, discussing subjects of top current interest to yourself, and all other key men in plant and power services ... articles authored by men of authority, and responsibility. For of course you must keep abreast.

This is "post-graduate" editorial . . .

... for men of responsibility. Classroom discussions ... "preachments" from self-styled authorities on academic 'undergraduate' topics ... these find no place in POWER INDUSTRY's pages.

For these copies of our magazine are not received by 'beginners' nor by those in their student days.

POWER INDUSTRY's reading audience is an adult, experienced, busy, executive audience ... of men like yourself.

We invite your suggestions . . .

... if you have ideas on how our editors can serve you better, please write and tell us. Your constructive suggestions will receive an appreciative welcome.

Russell L. Putman

Russell L. Putman
Publisher

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October 1958

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POWER PLANT & POWER SERVICES INDUSTRY

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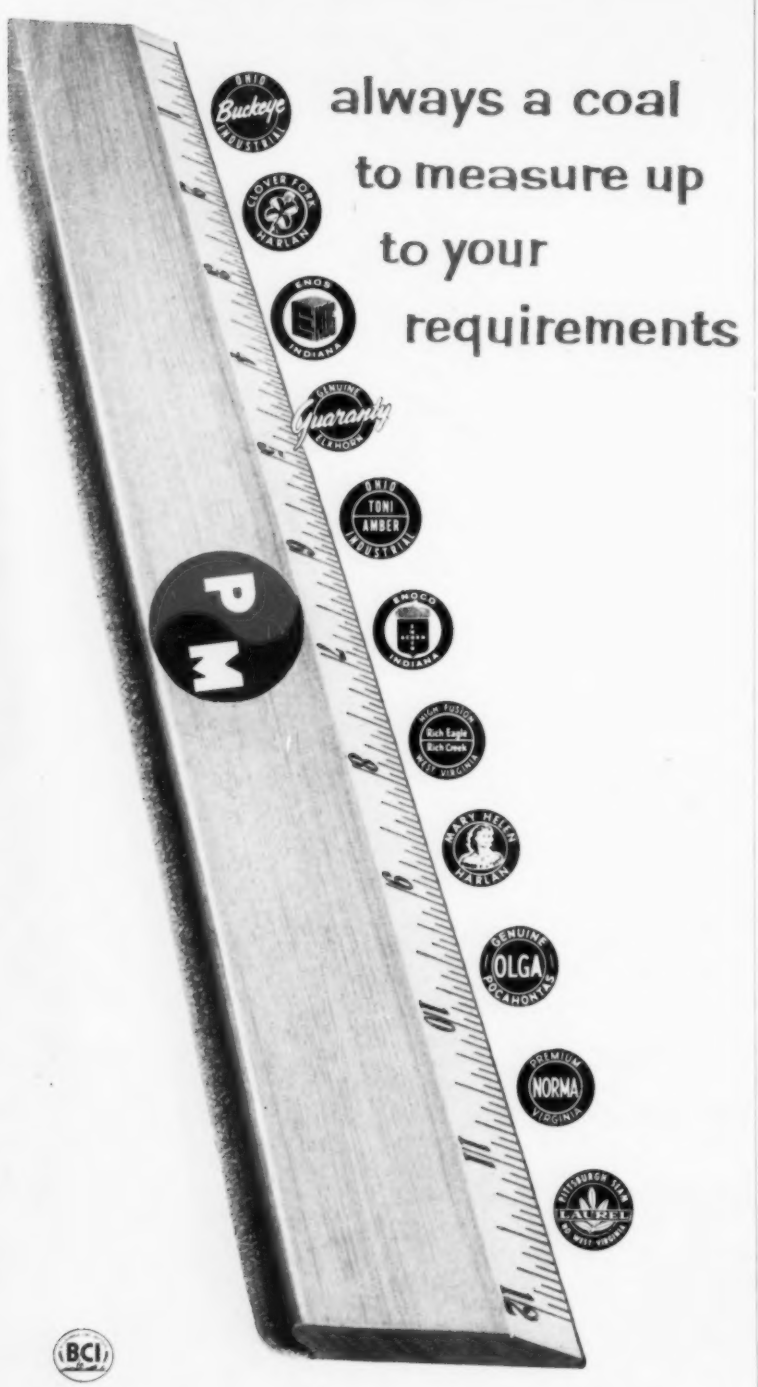

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Blast boiler scale with silent sound

Inaudible ultrasonic note from oscillator hammers at scale 200,000 times a day

Not to be confused with other electric methods of preventing or destroying boiler scale, a British development uses pulses of high frequency sound to actually knock scale from boiler tubes. The method can be used on shell type boilers at pressures to 450 psi and has been satisfactory with completely untreated water of average hardness.

Two principal parts of the unit are an electronic generator (13 x 10 x 6″) and an oscillating head (5 x 2″ diam) which is attached to the boiler or other device serviced.

AC from the line is converted to pulses of direct current which are fed to a nickel magnetostriction head which produces sound pulses.

Occurring about three times a second, the pulses have a frequency of 28,000 cycles and each lasts for about one thousandth of a second.

These inaudible pulses are transmitted through a metal disk to the water in the boiler.

A single pulse generator can power up to four of the magnetostriction units. These may be located anyplace up to 50 yards from the generator. Temperature limit for the head is 104°F — devices are usually connected to the boiler through a length of pipe (typically three feet).

In an operation, four of the heads develop about 30 watts of power. Manufacturer's studies have shown that too much ultrasonic power can be applied. It is important that protective mill scale on the steel itself should not be destroyed by these pulses.

Normal operation allows scale to build up to about the thickness of an egg shell. It is then broken off in patches which drop to a collection point.

(Crustex ultrasonic descaler is a development of H. N. Electrical Supplies, Ltd., Rochelle Works, Brixton Hill Place, London, S. W. 2, England.)

Circle 9077A opposite covers.

Delves into secret of light bulb life

Why do some light bulbs burn out before others? This problem has perplexed the light-bulb people for some time — chiefly, because of the insurmountable maze of mathematical problems involved in the variances of light bulb-outs.

The Lamp division of the General Electric Company is giving the mathematical job to a Bendix G-15 computer to untangle.

With the answers they get, the researchers hope to determine why bulbs of identical quality or similar manufacture show great disparity in length of life.

The answer will lead to light-bill savings and fewer bulb replacements.

Already, the computer has been adapted to help solve radiation problems involving temperature changes in wire filaments and filament vibration. These have been determined as controlling factors in the life of a light bulb.

Kennecott Copper builds power plant addition

Construction has begun on a $16-million power plant addition at Kennecott Copper Corporation's Magna, Utah, site. Addition will boost generating capacity from 100,000 to 175,000 kw. The Rust Engineering Co. of Pittsburgh is the contractor.

THAT'S INTERESTING

Rubber balls in space

Rubber balls about the size of a basketball, yet tough enough to hold air pressure of 3000 psi, helped trigger the rocket that launched the Explorer into orbit. Rubber spheres, reinforced with glass and resin, are part of pneumatic system for first stage rocket of US Army's Jupiter C. Layer of new rubber compound developed by B. F. Goodrich Industrial Products Company, less than 1/8 inch thick, stops air leakage.

A real cool city

More than half of downtown Manhattan is being air conditioned. 93 million square feet of offices existing and under construction were surveyed by Frank Hudik, president of Hudik-Ross Co.

For more information circle 9078 on reader service card opposite covers.

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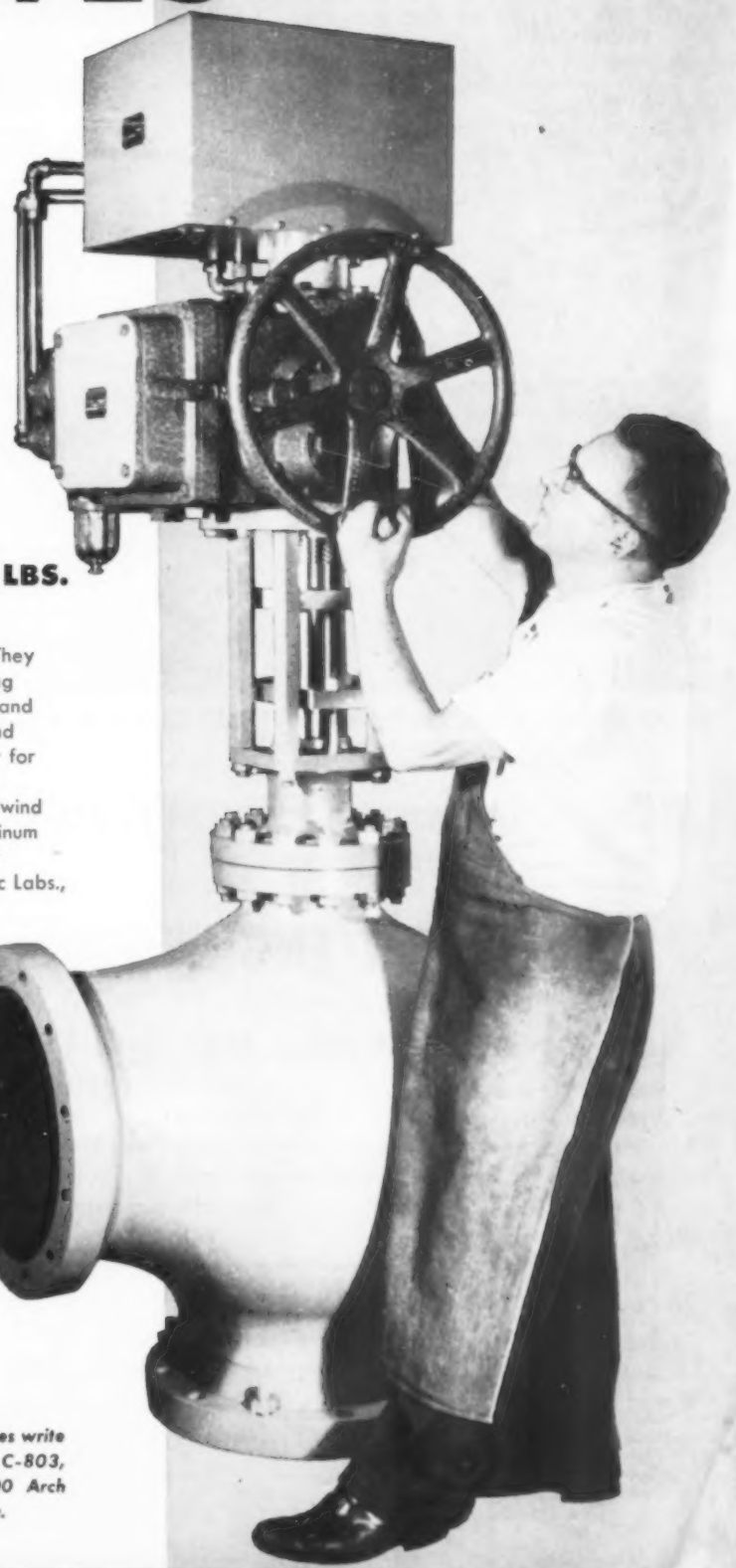
by CONOFLOW
for the
TOUGH
JOBS



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S valves by Conoflow are on day-in, day-out service handling the tough jobs in many industries. They offer unmatched performance for automatic throttling control of erosive and corrosive slurries, coking oils and liquids, and high pressure pipe line gases, steam and water. **S** valves have proved to be the final answer for such services as alumina refining, pulp mill digester relief, boiler feed water control, and experimental wind tunnels. A few well-known users are: Reynolds Aluminum Co., U. S. Steel, Humble Oil Co., Aluminum Corp. of America, Texas Co., Redstone Arsenal, Knolls Atomic Labs., and Olin-Revere Metals Corp.

The difference is in the design...
The patented, single-seated **S** valve is of heavy, rugged construction throughout. Extra body wall thickness, streamlined contours and heavy stem guiding make the **S** valve especially suited for high pressure drops. Venturi seat ring and parabolic plug assure tight shut-off. Self-sealing bonnet is leakproof. Sizes 1" through 4" carry ASA ratings to 2500 lbs.; sizes 6" and 8" to 1500 lbs. ASA; sizes 10", 12" and 14" to 300 lbs. ASA.

For complete data on S valves write for Bulletin S-1 to Dept. C-803, Conoflow Corporation, 2100 Arch Street, Philadelphia 3, Penna.

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YES, ED. WE'RE ESPECIALLY CONCERNED RIGHT NOW WITH LOWERING OUR PRODUCTION COSTS, AND SOME OF THE IDEAS I'VE PICKED UP HERE ARE GOING TO HELP DO IT.

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1248

Circle 9079 opposite covers.

Permits inert-gas welding in the field

An ingenious device has overcome the limitations of inert-gas welding of piping in the field. To date, inert-gas welding in the field has been limited by difficulty in retaining the gas in the weld area and then getting rid of the retaining device.

Actually the recently developed technique for field work is simple. All that is needed is a piece of 50-lb kraft paper — the kind in which groceries are carried.

The procedure makes use of a circular piece of kraft paper attached with masking tape as a baffle six inches from the ends of the pipe to be joined.

The paper is able to withstand pressure exerted by the inert gas and a welding temperature of up to 600°F. At the end of the welding process, during the annealing or stress-relieving phase, both the paper and tape disintegrate, leaving the pipe clean.

Procedure involves preheating pipe ends, use of suitable apparatus to hold pipe ends together, welding the roots without filler in the inert-gas atmosphere, and visual inspection of the internal bead before application of successive beads.

Welds can be made in any plane extending from the horizontal to the vertical. It is reported that excellent welds can be obtained without rotating or otherwise shifting the position of the pipes during welding process.

Robert T. Pursell, metallurgical engineer with Stone & Webster Enginering Corp., has had this technique patented.

Increases effectiveness of concrete hardeners

Development of an additive, called "P-15," has resulted in an improved, crystalline chemical hardener for concrete floors which increases resistance of concrete to dusting by 15 per cent.

The chemical hardener manufactured by AC Horn Companies, subsidiaries and divisions of Sun Chemical Corporation, consists of crystals having reduced surface tension — a factor which results in greater depth of penetration of the solution into the concrete.

The powdered chemical hardener is being sold under the trademark name of "Hornstone."

Low-cost seawater conversion

Researchers at Texas A & M report that the solvent desalting process for converting sea water to fresh looks especially promising because of the low cost involved.

In the process, a solvent and sea water are brought together at room temperature. The water dissolves in the solvent, leaving brine undissolved. After heating the water-solvent mixture for separation, solvent can then be re-used.

Improves light output of mercury lamps

Westinghouse engineers have announced development of an arc tube and electrode which results in improved light output during the entire life of mercury lamps.

Generally, mercury vapor lamps lose 30 per cent of their initial light output as a result of blackening of the arc tube. This blackening material comes from electrode erosion caused by the electric arc discharge.

The improved arc tube—trade named "Lifeguard"—contains an electrode with a new chemical formula. This, in addition to having electrode material completely shielded from the electric arc discharge, protects the electrode from erosion. As a result, far less material is deposited on the quartz arc tube during burning.

Laboratory tests at end of 7000 hours of use showed that mercury vapor lamps using these "Lifeguard" arc tubes still produced 90 per cent of their lumens.

Longer life for V-belts

Increased longitudinal flexibility with improved transverse rigidity are two features of a new line of V-belts manufactured by Boston Woven Hose & Rubber Co.

Longer life and better performance result from a construction using neoprene reinforced with Dacron fiber.

The Dacron cords offer high strength to absorb more shock loading. At the same time, they give flexibility, length stability following changes in humidity, and resistance to abrasion, heat, oil, acids, and most alkaline materials.

Opens corrosion research lab

Research laboratory which will aid in selection of materials for, and design and construction of power plant equipment has been opened by The Carpenter Steel Co., Reading, Pa.

Develops electric motor for underwater use

A motor for use under water — allowing the insulation system of its windings, its bearings and magnetic components to be totally immersed — has been developed by General Electric.

Coming up with an insulation system of irradiated polyethylene was the major factor in the development.

One of the primary applications of the "wet" motor will be with pumps in high pressure boiler circulating uses.

In this application, it will eliminate the pump seal, which might have to withstand pressures to 3000 psi.

Water from the pump is permitted to circulate through the internal electrical and mechanical components of the motor.

For boiler-circulating pump applications, motors of 250 and 350 hp are currently being produced.

...take another look...

Had you noticed? . . . .

. . . the design of this magazine is "different" —

— its "wide screen" pages give more effective presentation to editorial . . . and advertising.

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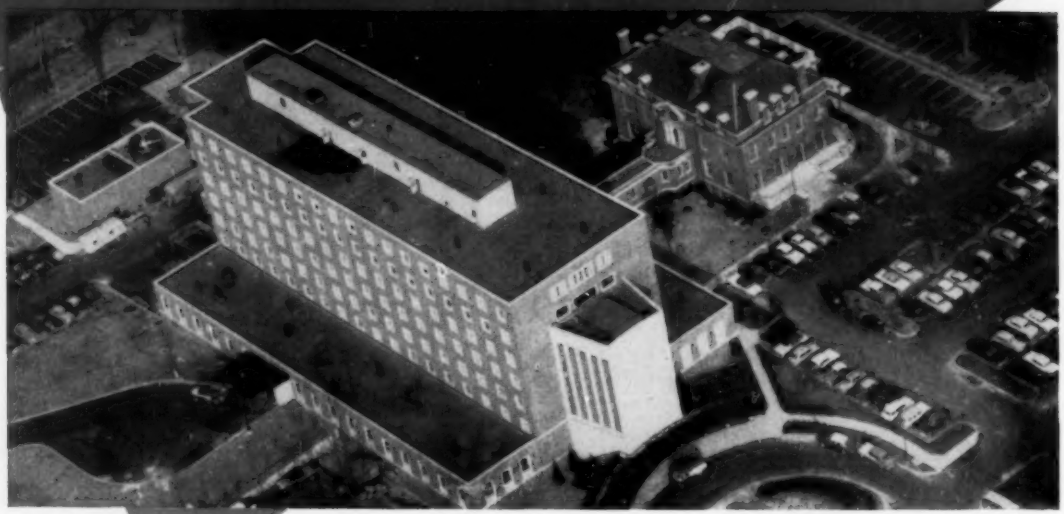
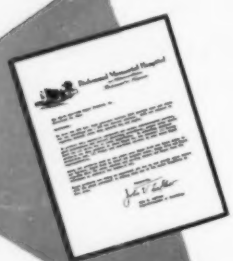
MOGUL-IZING* protects new Richmond Memorial Hospital



Richmond Memorial Hospital, Richmond, Va.



The North American Mogul Products Co.
Cleveland 13, Ohio

Gentlemen:

We have two 600 H.P. high pressure boilers that provide heat and steam for our buildings and a 500 ton Carrier chiller. Both are subject to rigorous demands since they operate day and night.

To protect this expensive equipment and assure uninterrupted service, good maintenance and correct operating procedures, proper water treatment for all units was of prime importance. In selecting chemical products for this purpose we chose Mogul for two reasons: (1) Proven protection and, (2) Prompt and courteous service by your local Mogul representative.

Among the products used in our plant are: Mogul M-16 and Mogul Amine in our boilers, Mogul M-12 to treat our Laundry water, Mogul M-12 and Mogul Algicide GM-2 for water chiller and cooling towers and Mogul Fuel Oil Treatment as additive for bunker-C oil.

Mogul products are doing an excellent job for us and should share honors with the plant personnel in making ours one of the model Hospitals in this area.

Sincerely,
John W. LeFleor
John W. LeFleor
Superintendent of Buildings

The North American MOGUL Products Company
Standard Building • Cleveland 13, Ohio

*This report from Richmond Memorial Hospital is one of many coming in from across the country. MOGUL-IZING your equipment with MOGUL products . . . backed by MOGUL field service is the combination that assures the best possible protection from the damaging effects of water . . . a complete, integrated water treatment program . . . Write, wire or phone and ask about the complete MOGUL-IZING plan for your plant or inquire about specific equipment protection. There is no obligation.

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Circle 9082 opposite covers.

REPORTS IN BRIEF

Markets ultrasonic unit for production welding

In welding, dissimilar metals and alloys — and especially extremely thin gauge materials — sometimes defy conventional methods. One technique which has the ability to lick these jobs uses ultrasonics.

Ultrasonic welding is a solid state joining process in which the materials to be joined are subjected to high frequency alternating vibrations. The resulting joints are accomplished without fusion, and in many materials, exceed the strength of similar joints made by standard welding methods.

There is little external deformation of welded materials.

A 2000-watt ultrasonic welder for production use has been placed on the market. It can be operated on ordinary 230v circuit, and consumes a maximum of 3.5 kva even when joining 0.050-inch 1100 aluminum sheet.

Operation is simple: operator places work to be welded between two welding members or sonotrodes, and activates a foot switch which initiates the entire weld cycle automatically.

The high frequency vibrations, which accomplish the joining, are generated by a transducer in the welding head system and are transmitted through coupling members to the work.

Semi-portable unit, a spot welder, has a welding frame of box-beam construction, a hydraulic force system, nickel transducer, and a heavy duty generator, designed for continuous duty. Unit is instrumented with an electronic cycle timer, and a Bourdon-tube force gage.

Materials that have been bonded together, either to themselves or to other metals, by ultrasonic welding include aluminum, copper, nickel, stainless steels, molybdenum, tantalum and niobium.

(More information on the W-2000-SR-57-10 SONO-WELD may be obtained from Aeroprojects, Inc., Dept. PI, 310 East Rosedale Ave., West Chester, Pa.)
Circle 9083 opposite covers.

LETTERS

Your views are welcome in this column. Address "Letters, Power Industry, 111 East Delaware Place, Chicago 11, Ill." Letters should be brief and confined to the editorial of this magazine or other topics of interest to the plant and power services functions.

Wants address

In the July issue of POWER INDUSTRY under "Reports in Brief" on page 6 appears an item entitled "Coating Makes Material 150% Tougher." This material has been developed by Walmet Corporation, Detroit, Michigan. We would like to obtain more information on this product but have been unable to obtain a mailing address for this company.

We would appreciate your sending us further information on this coating product or, if not available, a more complete address for the Walmet Corporation.

E. P. GRUBEL
Engineering
E. R. Squibb & Sons
Division of Olin Mathieson
Chemical Corp.

• *Reader Grubel refers to the article announcing development of a soft-base carbide-impregnated coating material which increases service life of bearings, machine cams, kicker fingers and other metal components.*
The address of the Walmet Corporation is:
Walmet Corporation
29900 John R
Madison Heights, Michigan
The Editors

pH, tankage, and kudos

. . . please send me one copy of your "Fluid Mechanics" as mentioned by Mr. H. J. Moreau in the August 1958 issue letters section of POWER INDUSTRY.

Your magazine is passed on to me after which it is passed on to the power plant operators. The various articles are interesting and educational, especially articles like the one on "Controlled pH" by Mr. Fader, and "Safe Storage for Liquid Fuels" by Mr. Michael, as they are right along our line of equipment in use at this plant.

PAUL F. DICKENS
The ZIA Company

Likes "Lighting off" wants extra copies

We have the July, 1958, issue of POWER INDUSTRY. We like the article "How to Prevent Lighting Off Explosions" by Mr. J. B. Smith, Chief Engineer of Factory Mutual Engineering Division.

Please advise whether we can obtain about ten copies of this article.

H. W. DUNN
Personnel and Safety Director
North Shore Gas Co.

• *Extra copies of "Lighting off" article have been sent to reader Dunn. A limited number of single copies are available to others interested.*
— The Editors

Wants magazine

I have had the pleasure of being able to read copies of your magazine POWER INDUSTRY. I have found it to be very interesting and especially informative. Would it be possible for me to receive a copy of your magazine regularly?

I am a resident engineer for the Brown Engineering Co. and maintain a field office at the address below. We do engineering for such organizations as the Interstate Power Co. of Dubuque, Iowa, Public Service Co. of Sioux City beside numerous REA cooperatives throughout the state.

EUGENE F. WILTGEN
Brown Engineering Co.
Manchester, Iowa

• *We would be very happy to consider Mr. Wiltgen's request for addition to our circulation.*

Readers of POWER INDUSTRY *who do not receive personal copies may do so, if they qualify, by contacting our circulation department.*

Just fill out and mail the card in the front or back of this issue. Be sure to fill in all the information requested. Postage will be paid by POWER INDUSTRY.

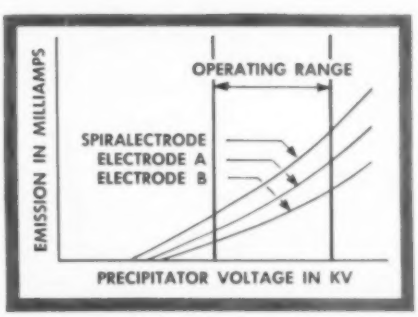
The Editors

1500 miles of Spiralectrodes in Precipitator Service!

That's real proof of superior performance. Over 1500 miles of these emitting electrodes have been installed in 'SF' electric precipitators . . . delivering 50 to 100% more electron emission than conventional types of electrodes.

There are sound reasons why Buell *Spiralectrodes* are providing superior emitting efficiency in actual dust collecting applications.

- *Spiralectrodes* are *"emission engineered"* – pitch and diameter are custom designed for each application . . . of critical importance with high resistivity dust.
- *Spiralectrodes are precision made from stainless steel*– of uniform quality, corrosion-resistant.
- *Spiralectrodes minimize efficiency-loss of dust build-up* –no horizontal surface to collect dust, positive rapping cleans electrodes.
- *Spiralectrodes maintain predetermined tension* – (no weights required) . . . dampen effect of vibration caused by electrical pulsation, thereby minimizing electrode breakage.
- *Spiralectrodes'* controlled area emission stops sparking effect of "point emission."



Above chart illustrates the superior emission of the Spiralectrode: its corona voltage is lower and its emission is higher than other types of emitting electrodes over the entire operating range of industrial precipitator voltage.

The superior operating characteristics of Spiralectrodes contribute to continued high efficiency of Buell 'SF' Precipitators. Detailed information of this and other exclusive features are described in a booklet, "Buell 'SF' Electric Precipitators." Send for your copy: write Dept. 90-J, Buell Engineering Company, Inc., 123 William Street, New York 38, New York.

buell®

Experts at delivering Extra Efficiency in

DUST COLLECTION SYSTEMS

Circle 9084 opposite covers.

AIRETOOL

automatic

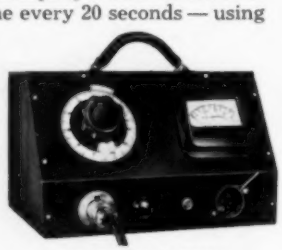
TUBE EXPANSION CONTROLS

roll tubes faster... with uniform accuracy!

In Airetool automatic tube expansion controls, precise electrical "feel" replaces inexact manual "feel" and human error! This assures uniformly accurate tube rolling at a high rate of production . . . even with semi-skilled crews. For example, a coppersmithing company rolled-in 850 four inch OD, 13 gage copper tubes in 5 hours — one every 20 seconds — using Airetool's automatic tube expansion system.

Control No. 113-15 rolls tube sizes ½" to 2½". Supplied with any combination of 3 sizes of electric motors. Produces tight, strong tube joints, stops distortion or breakage of tube sheet ligaments.

Control No. 103-5 designed for tube sizes ¼" to ⅞". 3 motor sizes available. Maintains precise expansion dimension desired every time. Unaffected by normal tube sheet hole size or tube variations.



ELECTRICAL SYSTEM

PNEUMATIC SYSTEM

Airetrol Model 1000 combines complete control system and powerful pneumatic motor in a single tool. Finger-tip expansion adjustment accurate within .001". For ¼" to 1½" tubes.

A pioneer in the tube expansion field, Airetool has conducted much basic research in the art of tube rolling. The results of this research are available to you, without obligation, through experienced Airetool representatives. Or, write for Airetool's Tube Expansion Control Fact Sheets.

BRANCH OFFICES: New York, Chicago, Tulsa, Philadelphia, Houston, Baton Rouge.

REPRESENTATIVES in principal cities of U.S.A., Canada, Mexico, South America, England, Puerto Rico, Italy, Japan, Hawaii.

EUROPEAN PLANT: Vlaardingen, The Netherlands.

CANADIAN PLANT: 37 Spalding Drive, Brantford, Ontario.

AIRETOOL
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

Circle 9085 opposite covers.

LETTERS

Depreciation scale OK

The article on page 18, "Depreciation in Capital Investment," of the February 1958 edition of POWER INDUSTRY, was of much interest.

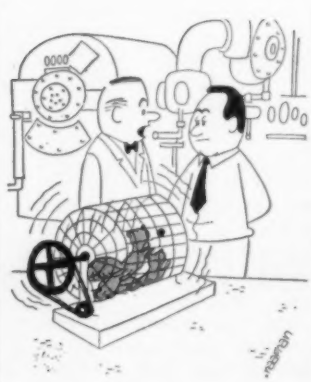
We would like to see the investment dollar graduation line extended from 100 to 500. If you have this information available, we would appreciate receiving a copy.

M. T. MacPHERSON
Works Engineer
The Symington-Gould Corp.

• *We originally had an explanatory note in the write-up of our "depreciation" nomograph on page 18 of February POWER INDUSTRY. A lack of space compelled us to remove it. Thus it is clearly our fault if you were confused by the "10-100" designation on the investment scale.*

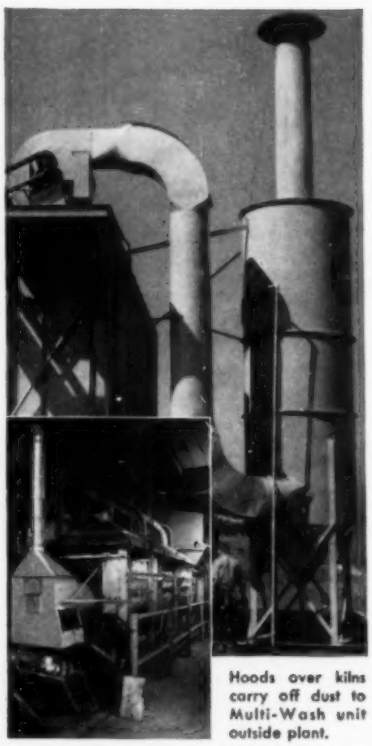
You can use this scale to indicate any number. If, for example, you contemplate an investment of $500.00 (or $50,000), simply use the "50" mark on the investment scale. If other factors of the problem should bring your solution line across the "average annual cost" scale at "20" this would indicate an average annual cost of $200 for a total investment of $500, or an average annual cost of $20,000 for an investment of $50,000.

— The Editors



"We keep them on hand for standby."

MULTI-WASH
is perfect for
KILN DUST



Hoods over kilns carry off dust to Multi-Wash unit outside plant.

Here is an operation where kiln dust would be detrimental to health and even bog down machinery, were it not efficiently conveyed to Schneible Multi-Wash Collectors and disposed of in a wet state.

There is no nuisance to plant or community when dusts are collected the Multi-Wash way.

You may actually have a paying proposition by using Multi-Wash to reclaim process materials or salvage a by-product for profit.

Call us in to review your processes and help get maximum efficiency throughout your operation. Your local Schneible representative is ready to help you. Write or phone direct if you wish.

SCHNEIBLE

Refer to Sweet's File No. 1e/5c

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Circle 9086 opposite covers.

OCTOBER 1958
VOL. 74 NO. 10
POWER PLANT & POWER SERVICES INDUSTRY

Internal Self-Purification
What it is — How it works

Higher pressures have brought stringent requirements for boiler operation. One of these is the need for purer, and still purer feedwater. While feedwater purity demands have been moving toward the ultimate, a new scheme has been devised — continual purification of the water already in the system. Here's an appraisal of this method with its pros and cons

PRO —

— high-rate scavenging of condenser leakage, silica pickup, makeup solids, corrosion products to hold total dissolved solids in the parts per BILLION range
— reduces time and equipment for water treatment, maintenance
— extends the high-efficiency life of turbines and often ups thermal efficiency to 1%
— resins used are less susceptible to fouling. Regeneration is less frequent because impurities are already in a low range
— system is insurance against condenser tube rupture . . . even for seawater cooling there is time for a planned shutdown
— high-capacity, fast-acting resins are used so that small units handle high rates at a capital saving

CON —

— additional capital investment. However, one estimate is that equipment will pay for itself in two years in overall savings
— added cost of condensate pumping
— unknown effect of tiny amounts of dissolved solids from the resins. (Research on this score is currently in progress)

V. J. CALISE, Graver Water Conditioning Co.

Every once in a while, normal "inching" progress is supplanted by a "quantum jump" achievement in every field. It is my belief that just such a jump has been accomplished for water treatment in the high-pressure boiler field by internal self-purification[1,2].

This internal self-purification of make up feedwater is being accomplished by high-rate filter-demineralizers. It is a direct solution of the problem of condenser leakage, silica pickup and formation of boiler and preboiler corrosion products.

These problems exist in many high pressure drum boilers. They are critical where pressures exceed 1200 psi. They may be even worse in once-through, non-blowable and "universal" boilers now under study.

Methods we've used in the past to solve these problems have carried a considerable penalty. A paper[3] delivered to ASME showed that 0.5 to 1 percent loss in thermal efficiency could be expected in all the high-pressure cycles studied.

This loss, said the authors, occurs during the initial base load period because of deposit carryover in the steam. Indirectly, of course, it is due to pickup of solids in the condensate-feedwater cycle.

And the penalty for such losses in a 1.5 million lb/hr unit at 1800 psi could be $30,000 to $50,000 a year.

Loss Can Be Stopped

It is believed that not only can virtually all this loss be recovered, but, in addition, other substantial savings in

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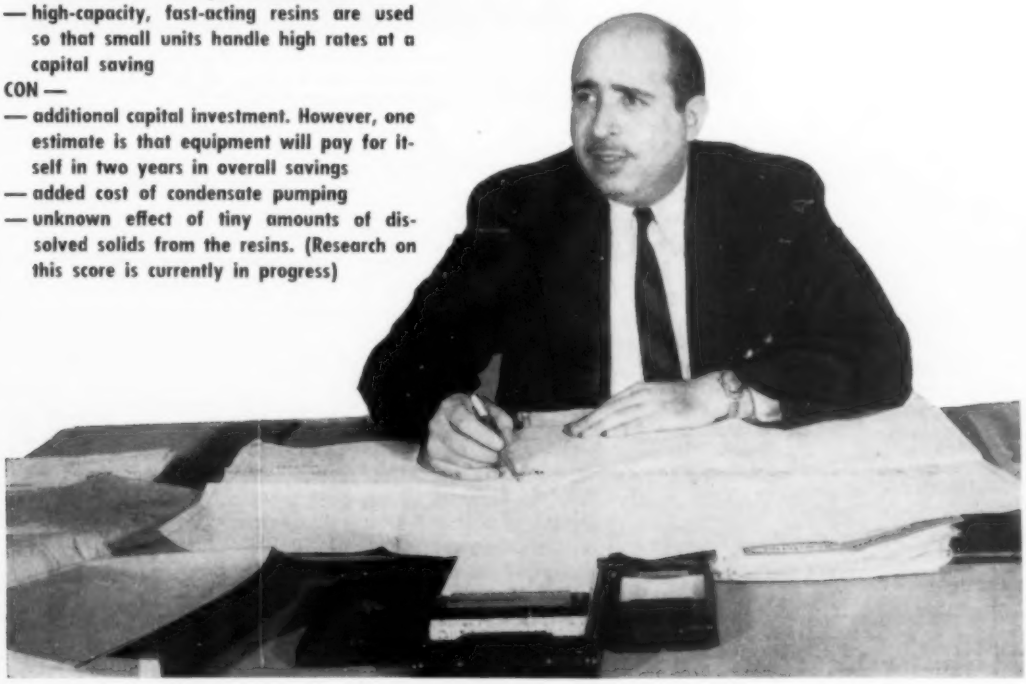


Vincent J. Calise has spent more than 20 years dealing with all aspects of the water conditioning field. Among the many developments and applications in water treatment, field pioneered by Mr. Calise, are those on the use of demineralization (ion exchange) process for power plant and process water treatment, hot process treatment, deaerating heater designs and applications in power plant cycle; clarification and softening of hard and turbid water supplies; and application of ion exchange to plating and waste problems.

He also worked on the development and application of the so-called seawater "desalting Kit" used during World War II.

Author of over 290 technical papers, speeches, monographs and articles, Mr. Calise is an active member in ASME, Engineers Society of Western Pennsylvania, American Power Conference, and A.I.Ch.E.

Internal Self-Purification —

labor costs and operation can be effected by using high-rate scavengers of condensate employing filter-mixed-bed demineralizer units.

This is also true for the once-through, subcritical and supercritical boilers and drum-type boilers.

Although great emphasis has been placed on requirements for ultra-pure makeup water to high pressure closed cycles in the recent past, it is not generally known that condenser leakage frequently can be the source of the greatest amount of solids introduction into the cycle.

For example, a 1 ppm total dissolved solids purity in the makeup feedwater for 1.5 million lb/hr cycle having 0.5 percent makeup means only 63 lb/year of solid material introduced into the cycle.

However, only 0.025 percent leakage of flow from the condenser cooling side to the steam side in a cooling water with 200 ppm TDS can produce 630 lb/year of solids. And this is figured on a relatively low solids cooling water of 200 ppm.

Cooling waters of higher solids of 1200-2500 ppm (cooling tower) and 25,000-35,000 ppm (seawater) TDS range will consequently increase solids pickup to even higher values.

This more clearly puts in perspective the need for re-evaluating the frequently mistaken emphasis on ultra-high makeup water purity and the need for means of condensate and feedwater purification, internally within the cycle[1].

The concept of internal self-purification of condensate was developed for use in supercritical and nuclear boiler turbine cycles.

Impetus was the design of such supercritical units as American Gas & Electric Company's Philo Unit (4500 psig, 1,715,000 lb/hr); Cleveland Electric Illuminating Company's Avon No. 8 (3500 psig, 1,715,000 lb/hr), and Philadelphia Electric Company's Eddystone Station (5000 psig, 2,000,000 lb/hr)[1].

What Is It?

By definition, internal self-purification of condensate means the treatment, within the cycle, of an already purified feedwater, such as the effluent from a conventional multi-bed demineralizer system or a turbine condenser hotwell.

The result of this self-purification is a condensate "polished" to a purity measurable in *parts per billion*, instead of the usual parts per million. This is generally called ultra-pure feedwater and it has given rise to an entirely new jargon and standard of measurement.

Chemical analytical methods to measure the infinitesimally small amounts of impurities in such water must be accurate in the range of fractions of a part per billion.

A deaerating heater has been used in the past as a gas scavenger and can reduce corrosion-producing gases, including oxygen, to values of 5 parts per billion. Internal self-purification of condensate, by reducing the other contaminating agents (colloidal materials, metallic corrosion products, dissolved solids, salts, silica) produces a feedwater with maximum concentrations of 50 ppb impurities for supercritical boilers.

In higher pressure subcritical boilers of the drum or once-through type, the maximum can be reduced to within a range of 50-200 ppb of total impurities. These levels represent tremendous reductions from levels previously obtained by various means.

How It Is Done

Internal self-purification of condensate is accomplished by a "Kidney" Scavenging System consisting of a mixed-bed demineralizer. Generally it is of a standard type, but resins, internal construction and flow rates are redesigned for use with the "Kidney" system.

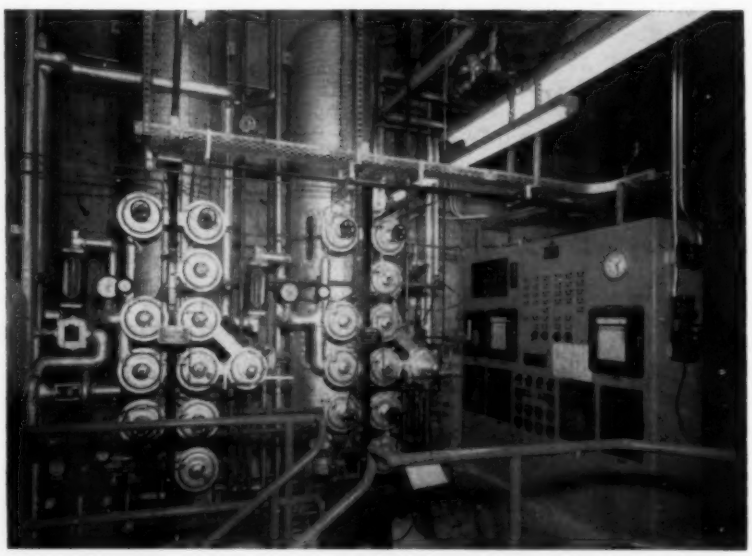
Element or leaf filters with cellulose as the filter material are generally used for this purpose. Chemicals used for the very infrequent regeneration of the demineralizer are sulfuric acid and caustic.

Although the entire system can be operated manually, automatic controls are featured to cut down operator attention and maintenance.

Size of a "Kidney" System is relative. A system operating at a flow rate of 25 gpm/sq ft and treating 1000 gpm of condensate, would require an overall operating space of about 200 sq ft and 15 ft of headroom.

If this system were designed to treat only a portion of this condensate, as is frequently the case, it would be smaller and require less space.

On the other hand, to treat 1800 gpm at 20 gpm/sq ft, the system would require an operating space of about 500 square feet.



Here is an installation of two mixed-bed demineralizers of the type used in a scavenging system for condensate purification within the boiler system. System is automatically controlled from central panel

Advantages

What are some of the more important advantages of high rate "Kidney" Scavenging?

First, "Kidney" Scavenging effectively combats the main sources of contamination such as condenser leakage, silica pickup, makeup solids and corrosion products formed within the boiler-turbine cycle, reducing impurities in the feed-water and condensate and boiler solids to "controlled" parts per billion.

Thus, it virtually eliminates the problems caused by internal contamination of condensate and feedwater and provides maximum steam purity. By keeping boiler tubes and turbine blades clean of deposits, and preventing build-up of corrosive products anywhere in the cycle, it limits blowdown requirements and reduces turbine outages.

Thermal losses are reduced and thermal efficiency and on-time power production are increased.

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Third, scavenging extends operating runs. As a rule, turbine units with a 30-year total life only operate at 90 to 100 percent for about five years. As indicated previously thermal efficiency improvement of up to 1 percent can be expected.

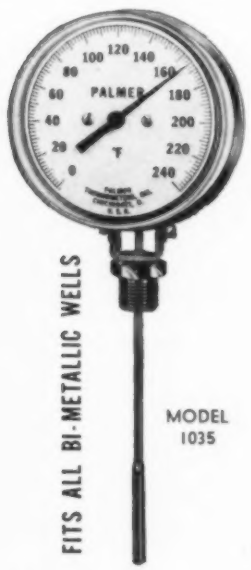
Fourth, "Kidney" Scavenging is much less susceptible to problems of resin fouling

(*Continued on page* 17)

Outstanding Accuracy

PALMER

Dial Thermometer



Check these functional features

- Direct-drive Bourdon Coil with a filled system for longer lasting accuracy.
- Stem can be placed at any desired angle and case can be rotated to most readable position.
- External calibration for zero setting.
- Unaffected by stem alignment.
- Accurate to one scale division.
- No sticking at any temperature.
- Non-corrosive case.

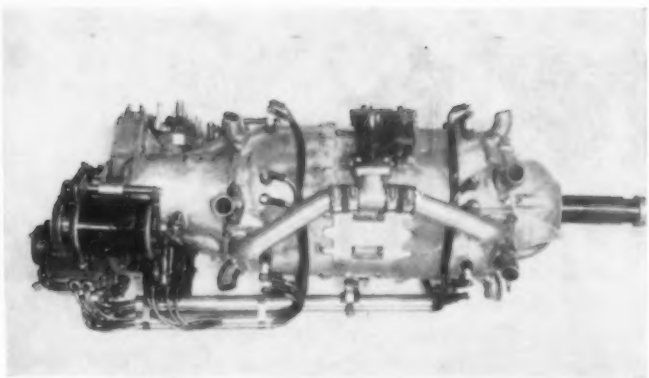
PALMER

THERMOMETERS, INC.

Mfrs. of Industrial Laboratory, Recording and Dial Thermometers

2515 Norwood Ave., Cincinnati 12, O.

Circle 9087 opposite covers.



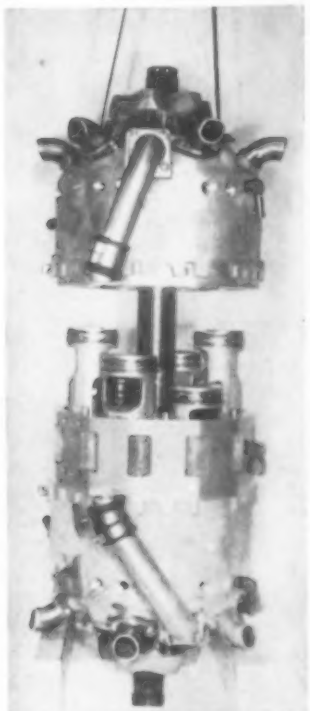
Torpedo shaped, this six cylinder duplex engine weighs 312 pounds, develops 200 hp

Look Ma, *no crankshaft!*

Reciprocating Engine with Half as Many Parts

- **six duplex pistons travel parallel with the shaft**
- **it uses no crankshaft, vibration damper, rocker arms, crankshaft bearings or connecting rods**
- **develops 200 brake hp at 1900 rpm without gear reduction**
- **conventional engine with similar rating has 2410 parts; this engine has 1206**

Pistons are fitted to the cam as engine is assembled



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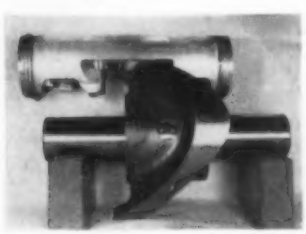
Heart of the engine is the main cam (shown) which transforms reciprocating motion of the pistons to rotation of the shaft. Two rollers in each piston follow the cam. Rigid, compared with a crankshaft, the cam makes the pistons follow a harmonic path.

Thus, inertial forces are taken up by the cam itself. They are not passed on to any other engine part. Also resistance to compression is offset by the driving stroke of the same or an adjacent duplex piston.

Note that curvature of the cam accounts for all four strokes of four-cycle operation. This means that each of the six duplex pistons can deliver power from each end in one shaft revolution.

Compare 12 power strokes per revolution thus produced to three power strokes for a conventional six in-line: It is obvious that this engine produces high power at low speeds, relatively.

Interestingly enough, it appears that this main cam is also easier to produce than a crankshaft. Standard machining techniques are used in all but final surface grinding of the forging.



Main cam of the engine supplants crankshaft, connecting rods, crankshaft bearings

Specifications and Performance

Top speed test data show a little better than 200 brake hp developed at about 1900 rpm. With a bore of 3¼ inches and a stroke of 3¾, the apparent displacement is 373 cu in. But because of the duplex arrangement it is actually 746.

Rather than double the power, however, this arrangement doubles the torque while halving the speed. It has the effect of a two-to-one gear reducer.

Valve-in-head design operates at a compression ratio of eight or 8½ to one. Standard distributors, carburetors, etc are used. Engine is liquid cooled.

Equipped with battery ignition, starter and generator,

(*Continued on page 17*)

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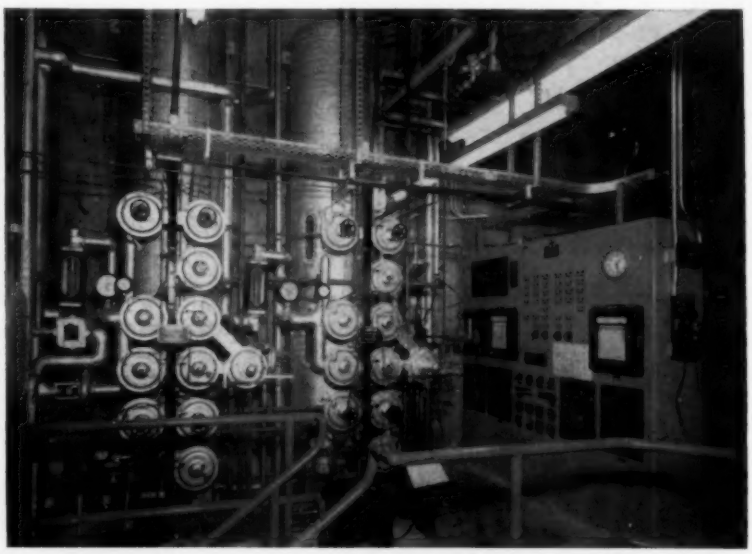

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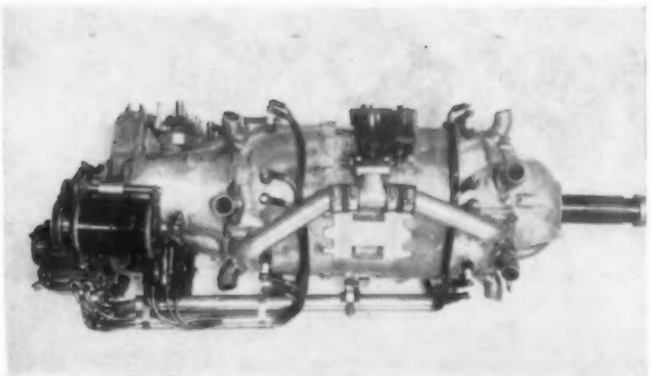

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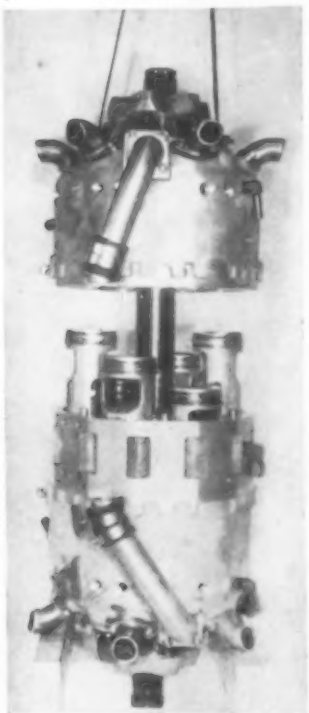

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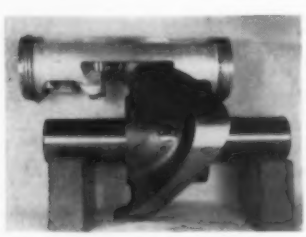
Thus, inertial forces are taken up by the cam itself. They are not passed on to any other engine part. Also resistance to compression is offset by the driving stroke of the same or an adjacent duplex piston.

Note that curvature of the cam accounts for all four strokes of four-cycle operation. This means that each of the six duplex pistons can deliver power from each end in one shaft revolution.

Compare 12 power strokes per revolution thus produced to three power strokes for a conventional six in-line: It is obvious that this engine produces high power at low speeds, relatively.

Interestingly enough, it appears that this main cam is also easier to produce than a crankshaft. Standard machining techniques are used in all but final surface grinding of the forging.



◀ Main cam of the engine supplants crankshaft, connecting rods, crankshaft bearings

Specifications and Performance

Top speed test data show a little better than 200 brake hp developed at about 1900 rpm. With a bore of 3¼ inches and a stroke of 3¾, the apparent displacement is 373 cu in. But because of the duplex arrangement it is actually 746.

Rather than double the power, however, this arrangement doubles the torque while halving the speed. It has the effect of a two-to-one gear reducer.

Valve-in-head design operates at a compression ratio of eight or 8½ to one. Standard distributors, carburetors, etc are used. Engine is liquid cooled.

Equipped with battery ignition, starter and generator,

(*Continued on page* 17)

"Coming events cast their shadows before"

CAPITAL IMPROVEMENT—

By **CARL B. WHYTE**
President, Procon Incorporated

Carl B. Whyte has long been active in engineering work. In addition to being President of the construction firm of Procon Incorporated, he is active in AIEE, ASME, API and is President of the National Constructors Association

Whether you realize it or not, you are in a tight spot. As one of the men responsible for providing power and plant services in your plant and industry, top management is looking to you for advice.

Today's tough business decisions must be realistic. We are all awake now to the fact that the post-war boom cannot continue forever without adjustments. But if you think that what your top management wants to hear today is the obvious "Cut costs, hold up all new projects," you may be very wrong.

Their decisions must be realistic in view of the economic situation of today and the changes evident now on the horizon.

Of course, we could all make better decisions if we knew, in detail, what was going to happen tomorrow, next year, or five years from now. But admitting that we cannot know this, it is easy to recognize that we are going through a chain of events very much like that of 1949 and 1953-54.

You may remember when "rolling readjustment" was a popular phrase. Let's look at what happened to building costs during that period of 1953-54, and the earlier recession of 1949.

The cost picture shown here for those periods deals with some very basic building materials. While the percentages may be different, the same sort of thing happened for nearly everything you would need, for example, in building a new power house, or air conditioning facilities, or what have you.

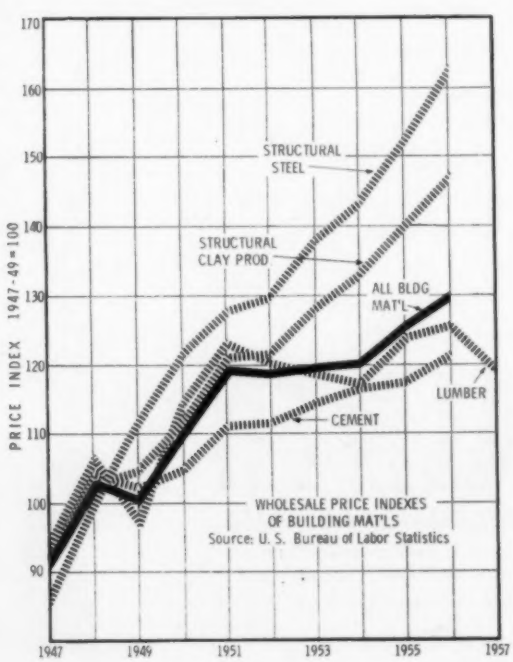
Put yourself in the shoes of the top executives of your company — would you have been happy to put off large capital improvement for two years, say, to learn that the cost had risen 20 per cent?

Yet there seems to be no reason to believe that the current recession will be greatly different from those of the recent past. Indeed, there are those who find reasons to believe that several factors will tend to make the inflationary step a larger one this time than it has been in the past.

Granted that "economy" is in the air, it is your very real responsibility to look hard and long at specific economies. This is the period when real economies can be the most rewarding — but deferring of needed capital improvements can be the most penalizing.

Buyer's market — your luxury

No doubt most of you remember the hectic days during and after the war when an order for almost anything was greeted by, "Um-hmm, what's your priority picture?" or perhaps more curtly with



Today's Biggest Bargain

- **If your plant needs capital equipment, but decides to "ride out" the recession, what will the equipment cost compared with its cost now?**
- **Are you really taking advantage of the buyer's market?**
- **How does the future look? Have you accurately sized up the future growth of plant services and power services in your situation? They can be bigger than you think.**

"Are you kidding?"

Needless to say, in a slack period of business, these things are not happening. And if it has ceased to be a novelty to expect to get what you order, it should not have ceased to be an opportunity.

As a practical engineer you know how much difference there can be in how two devices of "identical" design or specification are built. And you've learned how these differences can help or hinder in the particular needs you have in your plant.

This is the time to talk with the salesmen, engineers, and contractors who supply your capital goods. In some cases these suppliers have time on hand now that will allow them to look at new ideas and methods — perhaps for the first time in the past few years.

And it goes without saying that while their business is slower, they will be more anxious to tackle your non-standard job.

Nor is the buyer's market idea lost on suppliers of standard, catalog numbered equipment. Deliveries, now, are often "off the shelf," and prices in a good many instances have been lowered.

The real need to build

All of what has been said here has had to do with "needed" capital improvements. There can be no bargains in unneeded acquisitions. Well, what of this question? Do you need to consider new power facilities — boilers, standby equipment, distribution systems from steam and electric power?

And should you be thinking of new or overhauled heating, air conditioning, lighting, and other related equipment?

The best answer to any of these questions would depend on what your plant will be doing in the near future. That is, through the prime service life of the equipment you might install now.

If it is representative of the national economy, your plant will be busier in the years ahead. Federal government studies indicate that the gross national product in 1965 will be about $600 billion. This is more than half again as great as 1955's $391 billion.

It is true that some of this will be the result of the inflation we looked at earlier. But even allowing for inflation, the increase will be about 40 per cent.

Will your plant share in this growth? Almost certainly it will. Assuming that your plant provides a product or service that is not becoming obsolete, it would be hard not to share in the increase. A major factor in the boom forseen for the early 1960's is population increase.

And signs of the increase are not confined to paperwork studies. Look at the steel industry. Despite the fact that it has been operating at less than 60 per cent of capacity for several months, it is adding facilities fast. One company alone is now spending well over a quarter of a billion in capital improvements.

The pattern is repeated in the petroleum industry. And in the chemical industries.

Two factors make this whole idea particularly important to the power and plant services facilities. The first is quite simple: power, light, heat, and all the other necessities of production will never be obsolete. If your plant changes its procedures, or process, or even its whole role, it will still need them.

The second reason for improving these facilities is more complex. It is the same need which has led to automation. Whatever changes are made in methods, they will almost surely lead to more power consumption and more power availability.

Is automatic production equipment in the offing for your plant? Then you may be faced with tighter control of steam pressure, for example. Much of this equipment will not tolerate voltage variations. Power requirements may often be multiplied by ten.

And while you need not design now to meet these requirements, you should plan capital equipment that is being considered so that it can be expanded or fitted into such a system as seems likely.

This is the tight spot you share with your top management today. It is not a time for timidity. Your foresight now can mean more than at any time in the past few years — or for some years to come.

QUOTATION NO. 81656

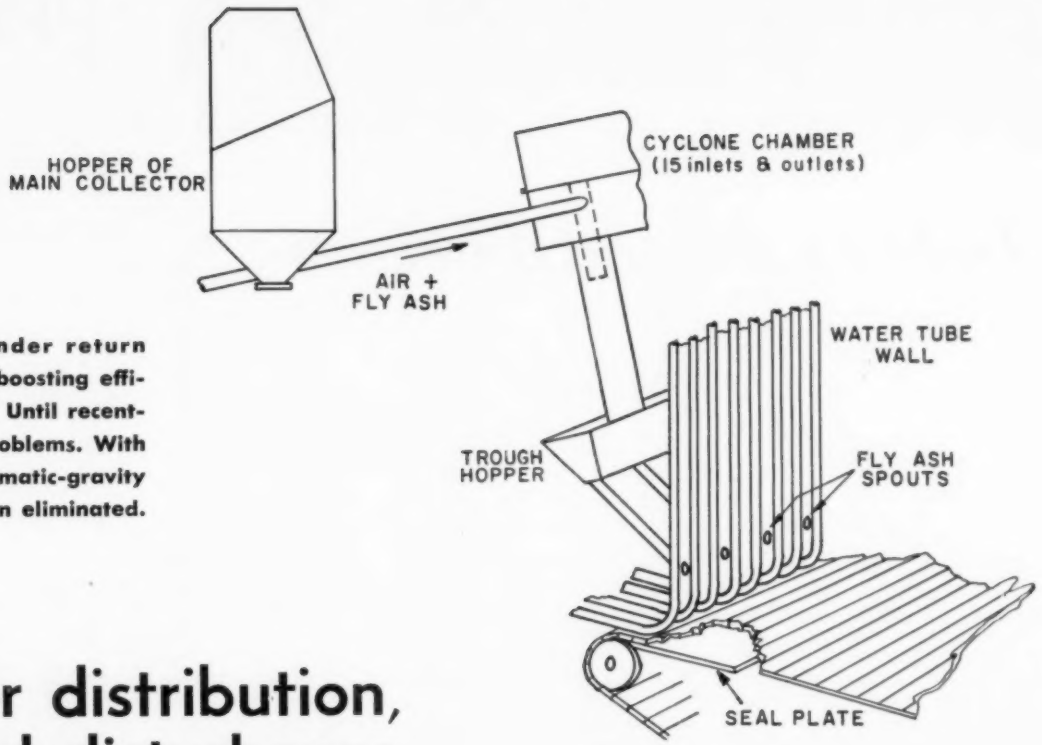
We are pleased to quote reduced prices, effective today, as follows:

QUANTITY IN STOCK	ELASTICOMETER TYPE	CAPACITY	REGULAR PRICE	REDUCED PRICE
21	RB-5	1/64 oz. to 12½ pounds	$670.	$595.
21	R80	1/2 oz. to 175 pounds	745.	695.
50	Dial Indicator	1" capacity & brackets for R80	60.	50.
9	FOL-100	0 to 45 & 0 to 225 lbs.	1,925.	1,795.
9	FOL-250	0 to 110 & 0 to 550 lbs.	2,700.	2,495.
2	T10 Torsiometer	0 to 9 inch lbs. Torque	695.	595.
2	T60 Torsiometer	0 to 52 inch lbs. Torque	695.	645.
5	T60 Special Torsiom.	0 to 88 inch lbs. Torque	795.	695.
1	T1000 Torsiometer	0 to 870 inch lbs. Torque	2,350.	1,995.
1	E1000	0 to 2,500 lbs. Hand operated	2,850.	2,795.
These 4 items are made to order only	E1000M	0 to 2,500 lbs. Motorized	3,675.	3,995.
	E4000	0 to 10,000 lbs. Hydraulic	4,200.	4,995.
	AE-100	0 to 275 lbs., Automatic	4,200.	
We also have over $5,000.00 of replacement parts in stock. Send in your old testers for repair and recalibration.			200.	95.

DELIVERY: Immediate delivery on stock items, subject to prior sale. Additional testers will be ordered and we will try to keep a stock on hand at all times.

TERMS: 1/2% 10 days, 30 days net ... plant Quotation firm

A quotation a la 1958: Prices have been reduced an average of seven per cent, immediate delivery is promised and number of units in stock is listed



Since its introduction in 1934, cinder return has been recognized as a method for boosting efficiency on spreader-stoker fired boilers. Until recently, methods of handling did present problems. With the introduction of the gravity and pneumatic-gravity return systems, the problems have been eliminated. This development now . . .

Gives better distribution, less fuel bed disturbance with cinder return

Development of the gravity and gravity-pneumatic cinder return systems has produced effective method of returning fly ash to the furnace for combustion.

Now, those using stoker firing of the forward moving grate type can have a cinder return set-up which will give good distribution of cinders in the stoker with no fuel bed disturbance. Application is limited only to boiler designs with not less than ten ft clear headroom immediately behind rear water wall of the furnace.

The pneumatic-gravity development was triggered by design of a more efficient air seal for this stoker. This allows the rear end of the stoker to act as a coking or preparatory zone. Here raw fuel is coked and conditioned for active burning when it reaches the air supply area of the forward moving grates.

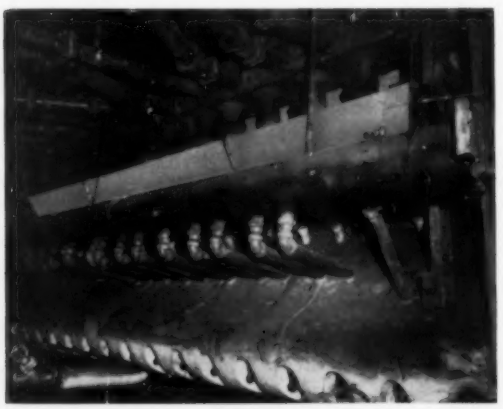
This means that excess air can be kept to a minimum. Complete return of all fly ash to the furnace is obtained, and all ash is discharged to the ash bunker.

One of the early installations of this type is at Orrville Municipal Power Plant, Orrville, Ohio. Return system is used on a 175,000-lb/hr Babcock & Wilcox boiler designed for operation at 415 psig at 750°FTT with 300°F feedwater.

The cinder return system is partly pneumatic because the dust collector hoppers are not high enough for an all-gravity feed to cyclones.

Fuel is 11,400-Btu coal with 15% ash and 2090°F fusion temperature.

Carry-over is allowed to flow steadily from cyclones by gravity to the "quiet" zone at



Fly ash falls by gravity from cyclone chamber to furnace

Because dust collectors are not high enough for all-gravity return to furnace, a pneumatic system is used. As seen here, the return lines run slightly uphill from collectors to cyclones ▶

◀ Schematic drawing of pneumatic-gravity cinder return. Five dust collectors catch fly ash in flue gas. Fly ash is returned by low pressure pneumatic line to cyclone chamber. Material from cyclone chamber falls by gravity through trough hopper onto stoker grate

the rear of the grate. By proper spacing of the flow points, fly ash is spread evenly over the entire grate width.

When deposited in this manner, the cinders are buried in the green fuel, and agglomerate with it as it softens.

Because of the rear seal, there is no tendency for cinders to be blown off the grates and into gas stream. Instead, they burn with the fuel bed on the grates, and ash is discharged at front of the stoker.

At Orrville, the grate is 17 ft 1½ in wide by 17 ft 8 in long. Five rotor distributor coal-feeders are served by a Stock non-segregating spout.

At the rear of the stoker, cinders are conveyed pneumatically through twelve carrier lines from a mutliclone dust collector to the cyclone chamber of the pneumatic gravity cinder return system.

Cyclone chamber consists of fifteen cyclones with vanes on inside to give a whirling motion. Here the cinders are separated and deposited in a trough hopper while the air is bled off to the boiler breaching.

The trough hopper extends approximately the width of the stoker grates. Cinders are discharged from hopper by gravity flow through 18 spouts of two-inch standard pipe, flattened to fit between boiler tubes.

System decreases concentration of solids in flue gas by as much as 50 to 75% over no return at all. Recirculation of solids has been reduced by 50 to 65% over conventional return methods.

With gravity cinder return, stack dust loading varies between 0.15 and 0.33 lb/1000 lb flue gas. ASME recommended allowable is 0.85 lb/1000 lb. (Figures are based on operation with 50% excess air.)

(Gravity-pneumatic cinder return for RotoGrate stokers is development of Detroit Stoker Company, Monroe, Michigan.)
Circle 9088 opposite covers.

(Multiclone dust collectors used in this cinder-return system are products of Western Precipitation Co., 1010 W. 9th St., Los Angeles 15, Calif.)
Circle 9089 opposite covers.

View inside boiler. Fly ash returns through 2" pipes, flattened to fit between tubes, and is distributed evenly along stoker grate

Internal Self-Purification

(*Continued from page* 11)

than conventional makeup treatment of surface water supplies. Condensate it treats is already "boiled free" of resin contaminants. In addition, the system provides for long runs without regeneration or maintenance because impurities are generally under 1 ppm.

Fifth, plants using high TDS (especially seawater) for condenser cooling will find that a "Kidney" System will provide continued operation for a short but adequate time to plan a shutdown, thus avoiding costly confusion.

Sixth, higher flow rates and high capacity (utilizing higher capacity and more rapid-acting resins) make for lower installation and operating costs.

Disadvantages

Against these advantages should be weighed certain factors. One is initial cost — although all-around savings will probably pay for the system in about two years.

Another factor is the cost of condensate pumping.

Unknown at the present time is the effect of infinitesimal amounts of soluble products from mixed-bed resins units. However, work is proceeding on measuring these effects.

When a new concept appears on the scene, it is often useful to compare the cost of putting it into practice with the costs of methods already available. In the case of internal self-purification of condensate, this is impossible because no other method has been developed to do the same job.

Other methods have been used more or less satisfactorily but none was completely successful in doing this job. Moreover, none went to the heart of the problem, i.e. purifying condensate internally to within the ultra-pure water zone of parts per billion[2].

Therefore, for the present at least, internal self-purification of condensate by the "Kidney" Scavenging System stands alone and can be applied safely to both supercritical and sub-critical once-through and sub-critical drum-type boiler systems with great advantage.

The use of "Kidney" Scavenging Systems promises to benefit the industry in all three ways. In the long view, it should help to ease the economic problems which the industry faces in the years ahead.

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2) "Treatment of Makeup Feedwater, Condensate and Recycle Water for Supercritical and Nuclear Reactor Power Plant Cycles." CALISE, V. J., and DUFF, J. H., ASME Paper No. 57-A-198, presented at ASME Annual Meeting, 1957.

3) "Observed Effects of Deposits on Steam Turbine Efficiency," ANGELO, J. and COTTON, K., ASME Paper No. 57-A-116, presented at ASME Annual Meeting, 1957. ■

What to see at the Show

Next month, POWER INDUSTRY is going to take you on a preview tour of the Power Show, which will be held in New York's Coliseum, December 1 to 5.

This is going to be a big show with lots to see. Next month's preview will give you some idea of the major developments that will be on display.

Reciprocating Engine

(*Continued from page* 13)

the power plant weighs 312 lb. Because it has only 1206 parts (2410 are used in a comparable conventional design) it can be stripped down and reassembled in about one-third the time for most 200 hp engines.

(Model 375 Cam Engine is a development of Herrmann Engineering Co., Dept. PI, 1405 Airway, Glendale, Calif.)
Circle 9090 opposite covers.

Effective Condenser Operation keeps it on the line

By R. A. BERNHARDT
Engineer-in-Charge, Design
Heat Transfer & Water Conditioning Department
Allis-Chalmers Mfg. Co.

Maximum savings are not necessarily obtained when a condenser is operating at maximum vacuum. For each different set of operating conditions, the cost of producing a vacuum must be weighed against the performance gained by the turbine for this additional vacuum.

The absolute pressure at which the system should operate depends on turbine design and pumping costs.

A turbine designed to produce rated load at 2-in. Hg absolute back pressure will not produce as much power in expanding steam from 2-in. Hg absolute to 1-in. Hg absolute as will a unit originally designed for 1-in. Hg absolute back pressure.

Power produced in expanding steam from atmospheric to 1 inch of mercury is roughly equal to that produced in expanding it from 200 psig, 600°F to atmosphere.

Even though additional energy may be extracted from the turbine for each reduction in absolute pressure, the cost of producing this vacuum may offset the gain.

Charges that must be applied to produce this vacuum include condensate reheating as well as pumping costs.

The lower the absolute pressure at which the condenser operates, the lower the condensate temperature and the more heating required in the boiler.

A major problem in operating a steam surface condenser is not having too much vacuum, but rather having a vacuum deficiency.

Low vacuum can be caused by reduced circulating water flow, increased air leakage or malfunctioning of the air removal equipment, and by a reduction in heat transfer rates caused by tube scale or slime accumulation.

Condensers, of course, act as strainers that accumulate rubbish, and block water flow. Tube sheets may become so badly fouled that unless some means of cleaning are provided, it may be necessary to take the unit out of service.

One cleaning method has been used for many years in the divided water box condenser. Circulating water flow to one-half of the condenser is shut off and this section is cleaned while the other half continues to carry the load.

Manual cleaning has proved very effective. But, with the trend toward remote controls using fewer operators, the reverse flow or backwashing system has come into wide use.

Backwashing systems have been operated successfully on both single- and two-pass condensers. They are designed to use both internal and external valve arrangements.

Backwashing

A backwashing arrangement for a single-pass condenser, using internal-type partition valves, is shown in fig. 1. With this system, one-half of the condenser is backwashed at a time with reduced water flow.

Both inlet and outlet water box valves are closed on the side to be backwashed, and the partition valves opened. This allows water to flow in the same direction in both halves of the unit instead of the normal counter flow.

To backwash the second side, the position of the inlet and outlet valves is reversed.

A single-pass backwashing arrangement, shown in fig. 2, uses external valves. This is a simple system but requires much more piping. If this were a divided water box condenser, double the piping would be required.

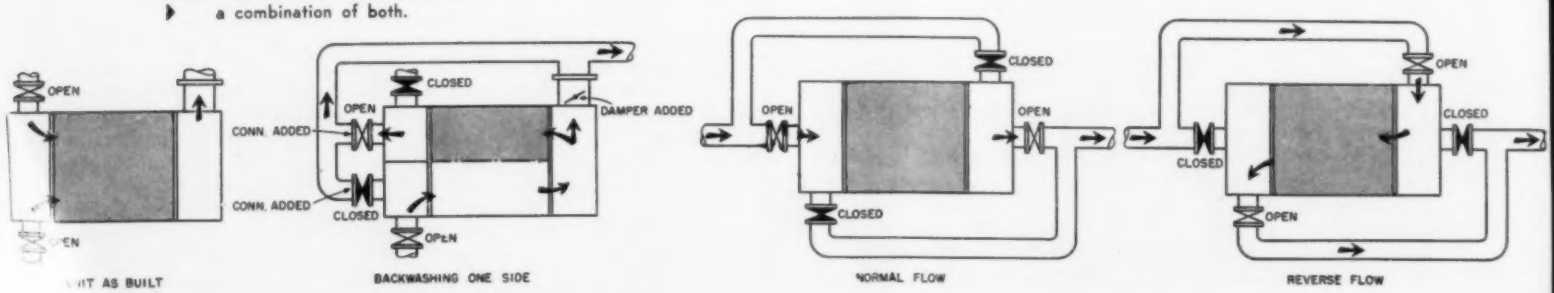
A two-pass condenser with internal partition valves is well adapted to backwashing. With normal flow, circulating water enters the top half of the condenser, makes two passes through the condenser, and leaves by the outlet nozzles in the lower half of the condenser water box.

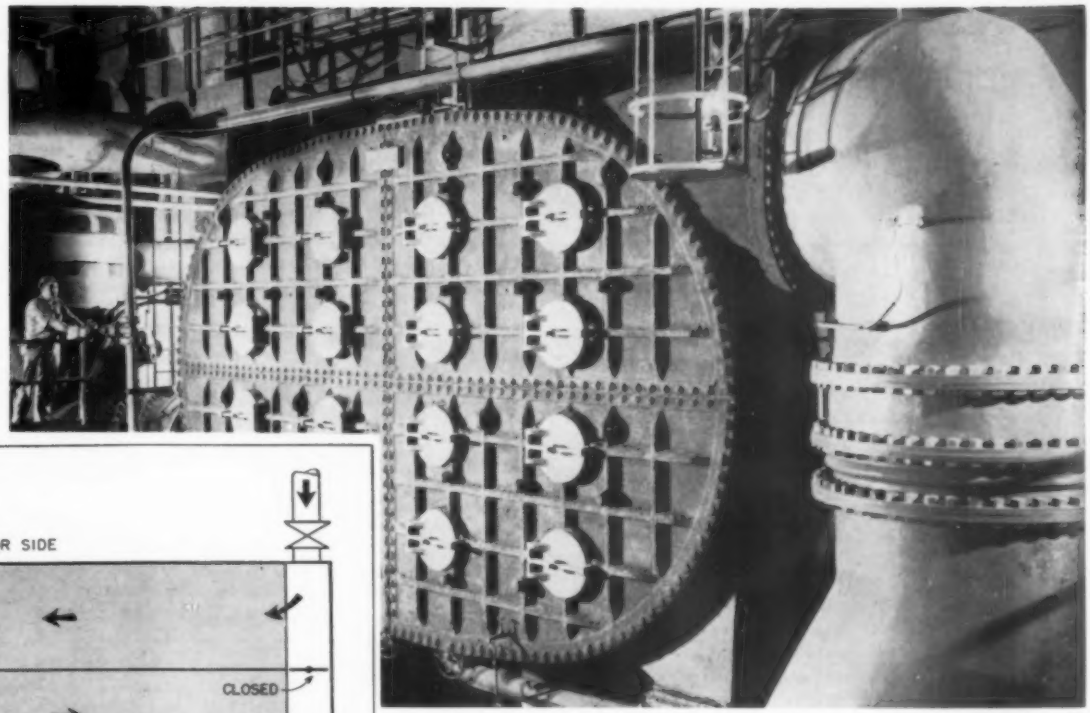
When backwashing one-half of the condenser, the inlet valve on the far side and the outlet valve on the near side are closed—all internal valves are open. This backwashes the upper farside and the lower nearside.

To backwash the remaining two quadrants, the inlet and outlet valves are reversed.

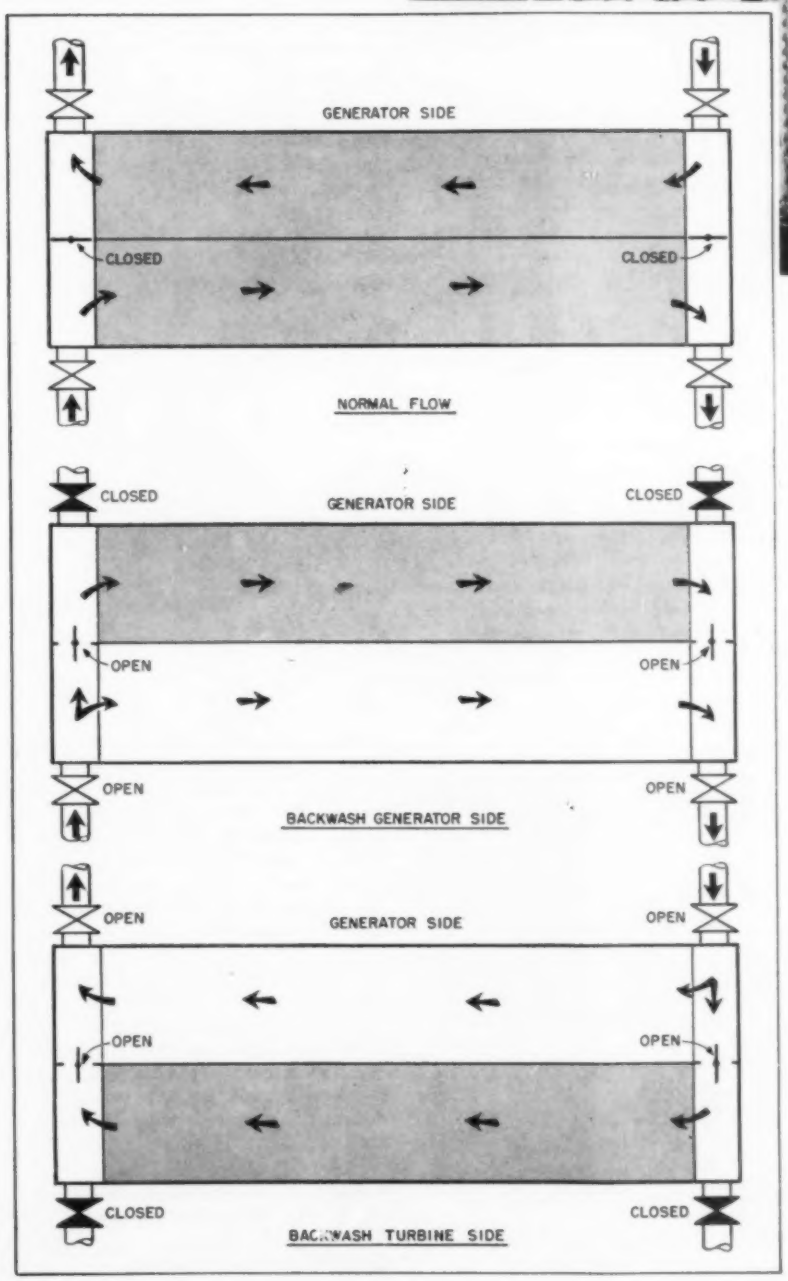
In a two-pass non-divided condenser with external reversing valves, the normal water flow enters the top half of the water box and leaves by the bottom half. To reverse flow, valves are operated to permit reverse water flow. With a divided water box condenser, eight valves would be required.

Single- and two-pass condensers give versatile control of water flow with external and internal valves, or with a combination of both.





This single-pass, 100,000 sq ft condenser has a divided water box. It is installed in a Midwestern power station.



Backwashing a single-pass, divided water box condenser is very easy with valves that are part of the unit. Turbine need not be shut down during backwashing operations.

Plants troubled with large amounts of rubbish find these backwash systems extremely valuable for maintaining substantial loads, even under the most adverse conditions. During flood stage, it was necessary for one plant to reverse flow every twenty minutes for several days to keep the unit operating.

The Goo was Glue

An interesting application of a backwashing system was applied several years ago by a large Midwest utility company. Upon starting the plant, operators quickly learned that large quantities of glue factory wastes, including pieces of hides and horse hair, could effectively plug condenser tube inlets and cause serious reduction in condenser vacuum.

In the early days of plant operation, especially with an east wind, it was a battle to keep the unit on the line.

Power company engineers licked this problem by designing and installing the simple backwashing arrangement. This system was installed during a 48-hour outage and has proved to be very effective for removing horse hair.

Two nozzles were added to the inlet water box cover. These were connected to the discharge water tunnel. A wall was added in the inlet water box to form two separate water compartments and a damper was added in the condenser outlet water nozzle.

A common cause of poor condenser performance is high air leakage. High air leakage not only affects system back pressure, but also affects oxygen content of the condensate.

Excess air leakage blankets condenser surface, reducing heat transfer and causing an increase in absolute pressure.

With high air leakage, the condenser has no chance to perform the deaeration of which it is capable. Air leakages over 3 cfm are considered too great. However, it is important that this leakage exists at some point above the condensate level in hotwell.

Air leakages of almost neg-

(*Continued on page 34*)

NEW DEVELOPMENTS

plant services — power services
maintenance

Measure dangerous fumes — every man a chemist

Any semi-skilled operator can test for gas concentration and make semi-quantitative estimates at the site of the test.

This is done with a detector consisting of hand pump, spare parts, tools, and carrying case with a total weight of four pounds. Sensitive elements — detector tubes — are light and replaceable.

Air to be tested is forced through detector with gas sampling pump. Specific indication of gas tested for is shown by discoloration of the detector tube.

Operator counts suction strokes of the pump while observing color of the tube. Color vs pump strokes shows concentration. This may be read from the tube directly or from a table.

Specific gases and concentrations are shown:

Sensitivity of tests

Gas tested for	Indication range (ppm)
Alcohol vapor	150 - 30,000
Ammonia	13 - 2600
Benzene vapor	15 - 420
Carbon dioxide	5000 - 50,000
(alternate range)	10,000 - 200,000
Carbon disulfide	13 - 320
(alternate range)	320 - 3200
Carbon monoxide	10 - 3000
(alternate range)	3000 - 40,000
Chlorine	0.33 - 70
Formaldehyde	2 - 40
Gasoline vapor	540 - 13,500
Hydrogen sulfide	7 - 840
Mercury vapor	0.0075 - 1.5
Nitrous oxides	2.5 - 50
Propane	1000 - 10,000
Sulfur dioxide	4 - 155
Trichlorethylene	18 - 560
Toluene vapor	70 - 2700
Water vapor	7.5 - 600

(Made abroad, Drager gas detector is available in the United States from Union Industrial Equipment Corp., 20 Davis Ave., White Plains, New York.)
Circle 9091 opposite covers.

Color change in detector tube shows concentration of gas being tested

Makes stainless clad copper wire

An electrical conductor for equipment which must operate at temperatures to 1300°F and corrosive conditions has been developed. Conductor uses copper wire clad with a chrome-iron alloy (stainless steel).

The wire is ideal for applications such as leads to heating elements in electrical resistance furnaces, electrical appliances, vacuum tubes, and as hook-up wire in electrical equipment.

Known as "Oxalloy 28", the conductor is produced by inserting an oxygen-free, high conductivity copper rod into a chrome-iron alloy tube. Subsequent cold drawing and annealing of this assembly provides an actual physical bond between cladding and core material.

Available in both wire and ribbon, the conductor can be furnished in a wide variety of spool and coil sizes. Wire sizes range from 0.005 inch to 0.250 inch diameter. Wire tempers range from soft annealed to full hard.

Ribbon, rolled from round wire, is available in widths up to 0.125 inch.

Technical information on "Oxalloy 28" may be obtained from Sylvania Electric Products Inc., Dept. PI, Warren, Pennsylvania.)
Circle 9092 opposite covers.

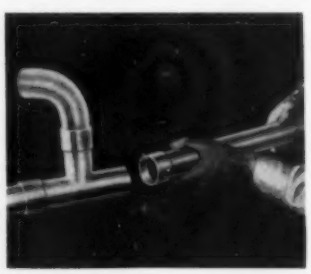
For brazing, welding stainless pipe

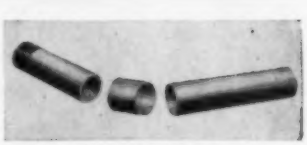
Aligning connector takes work out of the job

Drastically cutting the work requirements for welding or brazing schedule five and ten stainless pipe, an aligning connector holds pipe and fitting in place during the work.

The stainless connector fits snugly over ends of pipe or fitting to provide a socket joint. Snug fit holds both in place until welding or brazing secures the connection. An added feature: connector makes possible in-place preassembly of complicated process piping layouts.

(Aligning connector is a product of Horace T. Potts Co., 504 Erie Ave., Philadelphia 34, Pennsylvania.)
Circle 9093 opposite covers.





Connector (end of pipe) holds fitting and pipe in a snug connection until all welding is completed

An O-ring for everything — stops delays in repair

Since 70 per cent of all O-rings used industrially fall in the size range from 1 to 25, manufacturer has made up a kit of rings of these sizes. It contains 180 O-rings.

Plastic case which houses the rings has three important features. It "inventories" O-rings on hand in any size at a glance. Its plastic pegs duplicate shaft diameter for particular rings. It also has a built-in ring thickness gage.

180 rings in sizes from 1 to 25 supplied with ID and thickness gage

This gage is molded into the side of the kit. It provides instant measurement of the cross section of any ring. Knowing which peg the ring came from, an operator can double the thickness and add it to ring's ID to get OD.

Interchangeability data for O-rings by all leading producers is supplied with the kit.

(Select-O-Ring Kit is a product of Bearings, Inc., Dept. PI, 3634 Euclid Ave., Cleveland 15, Ohio.)
Circle 9094 opposite covers.

How to paint a room without dipping the roller

Pressure-feed tank helps wax floors, spray insecticide

Inexpensive pressure feed unit can be a big help wherever liquids like paint, floor wax or insecticide are being applied. It cuts liquid handling. It delivers the amount needed on the work at the touch of a button.

Since paint flows into the roller through its handle, painter never has to dip it

Time saving alone on a painting job is estimated to be about 25 per cent.

Here's how it works. The painter pours up to six quarts of paint into the tank. A few strokes of a hand pump pressure the tank. (Twenty strokes will do for a whole room.) He is then ready to paint.

Whenever the roller's paint supply runs low, he can touch a button in the three-foot handle. Paint then flows through ten feet of plastic tube to the roller. And control of the flow means no heavy spots as are produced by a "heavy" dipping.

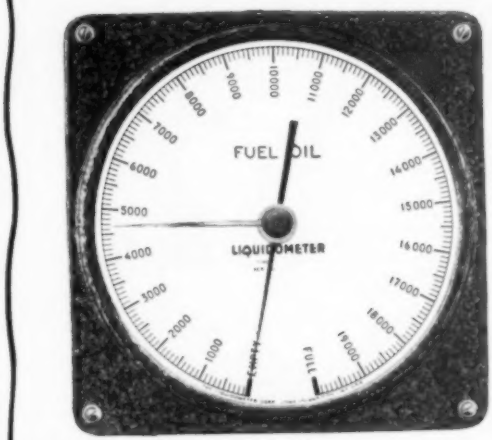
Both the evenness of the coat and lack of dripping save paint.

Waxing head for floors and a spray attachment are also available.

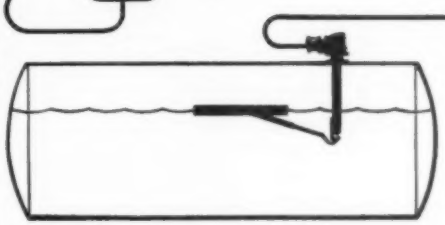
(Power-Flo unit is a development of Power-Flo Tools, Dept. PI, 1348 Blue Jay Dr., Pittsburgh 16, Pa.)

Circle 9095 opposite covers.

More money out of your condensers — see page 18



Senior
Case Size 12" Square



READABILITY DEPENDABILITY

Liquidometer Remote Reading tank contents gauges are self-contained and operate entirely automatically not requiring any outside source of power.

Liquidometers may be used on all grades of fuel oil from the lightest to #6 or Bunker C, Diesel Oil, Gasoline, Kerosene, Alcohol or practically any other liquid.

For residential tanks or small industrial plants several sizes of Levelometer gauges are available.

All Models approved by BSA, N. Y. Underwriters Laboratories and Factory Mutual.

Complete information furnished upon request.

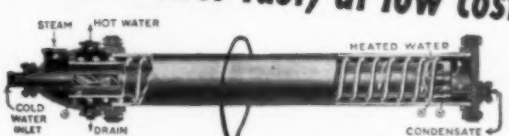
Write Dept. P

Since 1920 ...of proven quality

THE LIQUIDOMETER CORP.
LONG ISLAND CITY 1, NEW YORK

Circle 9096 opposite covers.

STEAMLINED!
to heat water fast, at low cost



In the Johnson Heater, water to be heated is routed first inside, then outside, a blanket of live steam. It's full pressure steam, too; up to 150 lbs., or 250 lbs. in heavy duty types, no reducers are needed. The result: faster, more efficient heat transfer for a unit of its size. No wonder industry has found so many applications for the Johnson "Instant" Heater, in heating water and process liquids of various types.

Sizes for all needs; write for literature

The Johnson Corporation
807 Wood St., Three Rivers, Mich.

Circle 9097 opposite covers.

Single-Point pH Recorder (Strip Chart Assemblies also available)

CAMBRIDGE pH INDICATORS and RECORDERS

Labor saving—profit producing!

In addition to portable pH meters, Cambridge makes line-operated Direct Reading pH Indicators and Recorders for permanent installation. They are accurate, stable and assure continuous and trouble-free performance. Either the Recorder, Indicator or both, may be located at any reasonable distance from one or several sampling points. The Glass Electrodes are placed in vapor-tight housings of clog-free sampling chambers.

Send for Bulletin No. 910 T

CAMBRIDGE pH EQUIPMENT

CAMBRIDGE INSTRUMENT CO., INC.
3550 Grand Central Terminal, New York 17

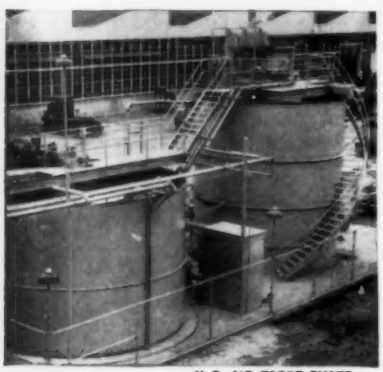
PIONEER MANUFACTURERS OF PRECISION INSTRUMENTS

Circle 9098 opposite covers.

ILLCO-WAY
ionXchange

soften
de-alkalize
clarify
WATER

REMOVE
organic matter
turbidity
color
iron



U. S. AIR FORCE PHOTO

HIGH-FLOW, UP-FLOW
CLARIFIER

The Clarifier shown above is part of an ILLCO-WAY ionXchange installation, at a metal-finishing plant, which is used for waste disposal and water recovery. Similar Clarifiers are widely employed to clear up surface waters used by various industries — removing organic matter, hardness, alkalinity, turbidity, color, and iron, as required by specific conditions.

USED AS PRE-TREATMENT

In many instances it is more economical to use a Clarifier in the initial part of a system. Certain water supplies contain organic matter or turbidity which can be removed most efficiently by flocculation, or contain carbonate hardness or alkalinity which can be largely reduced by precipitation — in which situations, a Clarifier is indicated as best. *Let us analyze the water you propose to use, and advise you.*

ILLCO-WAY
ILLINOIS WATER TREATMENT CO.
840 Cedar St.
Rockford, Ill.

NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.

Circle 9099 opposite covers.

Well damped ammeter can't burn out

AC-DC ammeter incorporates adequate damping. Only instrument of its type to measure both alternating and direct current, it is equipped with a large damping chamber for each scale range.

Eight types handle to 1000 amps

Heavily constructed, it has an insulated operated-trigger and plastic handle.

Instant readings can be obtained when the trigger is pressed to clamp tongs around line in question. Eight types are available to handle currents up to 1000 amperes.

(Tong test ammeter is a product of Columbia Electric Mfg. Co., 4519 Hamilton Ave., Cleveland 14, Ohio.)
Circle 9100 opposite covers.

Pressure control contains two separate switches; is explosion-proof

Dual switch control unit for air, gas or liquid pressures has been designed to operate in hazardous locations where explosive gases or vapors are present.

Unit contains two completely separate switches. Switches may be set together to simulate double pole circuitry or set apart to obtain independent operation.

Since control is uncalibrated, pressure settings are made by removing the cover and setting the hexhead adjustment screws.

Construction of cast iron base and aluminum cover permits use in Class I, Groups C & D; Class II, Groups E, F, & G; and Class III as defined by National Electrical Code. Approximate weight is 5 lb.

Many types of switches are available. They include: normally open, normally closed, or double throw with no neutral position. They are rated for 15 and 20 amps at 115/230 v AC.

All switches are single pole and suitable for ambient temperatures to 180°F.

(Type J99A pressure control is manufactured by United Electric Controls Company, 79 School St., Watertown 72, Mass.)
Circle 9101 opposite covers.

Plastic pipe lagging stands abuse, fumes up to 250°F

Snap-on pipe insulation is made of urethane filament foam plastic. Service rating for temperature is −200 to +250°F. It is specifically recommended for refrigeration lines and low pressure (5 psig) steam lines.

Low k factor insulation snaps around pipe with only one seam

Particular advantages of the material include freedom from fraying, crumbling, or breaking in handling. It is especially good when in contact with water or other liquids or fumes which are harmful to conventional insulating materials.

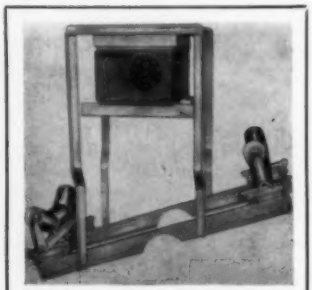
Preformed to fit all pipelines and fittings, it has a uniform outside diameter. It will properly nest with a second layer where extra thick insulation is needed. Since it is flexible, only one seam is required.

Unaffected by most corrosive conditions, material is also flexible and tough

Normally, factory applied moisture vapor barrier is used. For outdoor applications, a felt paper jacket can be used. Of course weather proof coatings can be applied to this.

Extremely light (about 3 lb/cu ft) the insulation adds little weight to a pipeline. Thermal conductivity of the material is 0.29 Btu/hr sq ft °F in.

(Nacconate pipe insulation is a product of National Aniline Div., Allied Chemical Corp., 40 Rector St., New York 6, New York.)
Circle 9102 opposite covers.



Scale fits existing belts

. . . and totalizes material at rates from 100 pounds to 300 tons per hour. It can be installed on level or inclined belts without altering or cutting them. Simple calibration is a feature: a single run with a known test weight establishes the linear calibration scale.

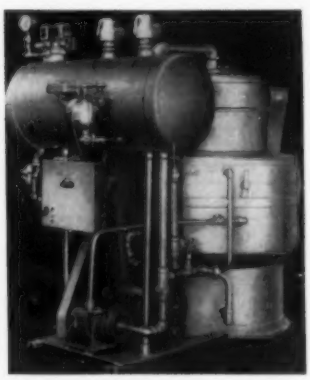
(Totalizing inventory belt is a development of Thayer Scale Corp., Thayer Park, Pembroke, Mass.)
Circle 9103 opposite covers.

150 hp boiler in 41 sq ft runs automatically

Redesign of an established boiler type has produced a 150 hp unit which occupies only 41.3 sq ft, stands 7 foot 3 inches high.

Design was based largely on a market survey of boiler users. The present unit has been built to occupy minimum space for its rating.

Completely automatic and explosion proof, this boiler requires no chimney for forced draft. Of course combustion gases must be vented.



Compact boiler is only 7' 3" high

The design is available in sizes from 20 through 150 hp. It can be furnished to deliver low pressure (0-15 psi) or high pressure (5-150 psi) steam. Smaller units burn number two fuel oil or low pressure (6" water) gas. Boiler 100 hp and larger can also burn number five fuel oil.

Because of the high capacity in a small space, coupled with fully automatic operation, it is possible to replace one large boiler by several of these units. Economy results because automatic controls cut units in and out of line as steam load varies — top efficiency can be obtained at any operating level. Plant is never without steam, under this scheme, even when one of the units is down for overhaul.

(Drum Modulatic boiler is a development of Vapor Heating Corporation, 6420 W. Howard Street, Chicago 31, Illinois.)

Circle 9104 opposite covers.

Another addition to the Vogt line of TOP QUALITY valves . . .

Forged Steel
WELDED BONNET

GENERAL GP PURPOSE

Gate and Globe
VALVES

150-800 Pounds Service

To eliminate forever potential body-bonnet leaks, Vogt engineers have developed these new General Purpose valves with seal welded bonnet joints.

This new addition to the world's most complete line of forged steel valves incorporates all the features of other Vogt GP valves—hard faced seats, hardened stainless steel wedges, drop forged pressure parts, and the numerous other advantages of Vogt's valve line.

The desirable safety feature of a back seat on the stem is retained while still offering the elimination of a possible body-bonnet leak.

Available NOW in both gate and globe types, ¼" thru 2", and in both socket weld and screw ends. These are priced identical to the bolted bonnet GP valves; gate valves the same as Series 12111 and globe valves the same as Series 12141.

Address Dept. 24A-FIP for literature

Series 2801 Gate Valve
Illustrated

Series 2821 Globe Valve
Also Available

Both series identical in dimensions and have 13% chrome stainless steel trim.

Vogt — GENERAL GP PURPOSE — Vogt FOR BETTER VALVES

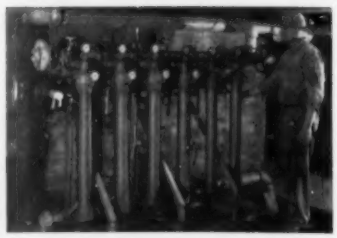
HENRY VOGT MACHINE COMPANY, Louisville, Ky.

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati.

FORGED STEEL
VALVES

Circle 9105 opposite covers.

RONNINGEN FILTERS
the answer to
Iron Water Problems



500 GPM Model 206 Filter successfully removes small but objectionable amounts of iron, sand and manganese which affect color and quality of finished product.

Construction: Bronze; 316 Stainless Steel; Steel; Aluminum.

Quick coupling, disconnect. Reconnect 60 seconds — no tools. Non-short circuiting. Sealed both ends. Filter element electric welded. Manual or automatic.

For water, petroleum, chemicals. Capacities, 10 to 1600 GPM. Pressures to 300 psi. Temperatures to 400°F.

Write for Bulletin #45570, Dept. P

STRAIN AGAIN WITH RONNINGEN

"Particles large or small, we filter them all"

RONNINGEN-PETTER CO.

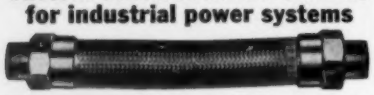
Vicksburg, Michigan Phone Midway 9-5911
Representatives throughout U. S. and Canada

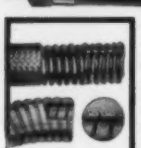
Circle 9106 opposite covers.

COBRA® FLEXIBLE

SEAMLESS METAL HOSE

Custom constructed assemblies for industrial power systems





All sizes in bronze, stainless or carbon steel, monel, inconel and low carbon nickel. Seamless spiral or parallel corrugation... Braided. All type of fittings and flanges welded, brazed or soldered. Also, interlocked hose.

write — wire — phone: RE 7-3311
...for prices and catalogs

COBRA METAL HOSE

5059 S. Kedzie Ave. • Chicago 32, Ill.

Circle 9107 opposite covers.

Horizontal scale, pointer show flow rate

Magnetic helix in rotameter projects reading

Pneumatic flow transmitter is based on conventional rotameter instrument. Novel magnetic helix used in transmitter also produces linear horizontal scale seen at top.

Transmits 15 psig air signal which is linear with flow

Encapsulated in a non-magnetic stainless tube floating between two bearing races, helix assembly is adjacent to and parallel to an extension tube of the rotameter.

Measuring float extension has a small magnet embedded in it. This moves within the tube in direct response to flow rate changes.

Leading edge of the helix, therefore, is constantly attracted to the magnet and turns to convert float's linear motion to a rotary one.

Pointer atop the helix assembly indicates flow rate. Flow sensing cam is also attached to the position converter. Being a calibration curve of the rotameter, it can guide a pneumatic cam follower to produce a linear pneumatic signal in the fifteen psig range.

(Model MPT-50 flow transmitter is a development of Brooks Rotameter Co., Lansdale, Pennsylvania.)
Circle 9108 opposite covers.

For a closer look, pocket microscope has 60X

Handy for checking condition of threads, bearings, or looking at the structure of pipe or boiler scale, 60 power microscope is hardly larger than a fountain pen.

It can be easily carried in the pocket since it is only 5⅜" long. Power is adjustable by sliding the tube in or out — there are settings at 20X, 40X and 60X.

Milled ring near objective lens is turned to bring objects into focus. A chrome tip reflects light onto the object used.

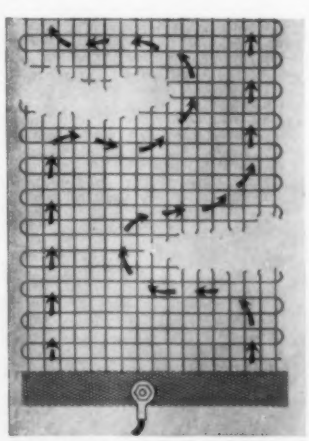
(60X microscope is a product of Edmund Scientific Co., Barrington, N.J.)
Circle 9109 opposite covers.

Heater takes punishment and mends itself

Wire mesh surface heating element has unique self-mending feature.

Part of the element is 36 wires per inch of heater width in a parallel circuit providing heat source every 0.028 inches. A continuous strand wire is looped and interwoven 30 times per inch perpendicular to the current flow.

By distributing current flow across the parallel circuit wires, any damaged area is bypassed. Heating elements again pick up the current flow on the other side of the break.



Horizontal "distribution" wires effectively bypass any breaks in heating elements

Available in many forms, the surface heater can be made into blankets for form fitting jobs or used as flexible heaters in rubber tape or sheeting.

Unit weighs about 0.1 lb/sq ft and is 0.012" thick. It operates on any voltage from 6 volts DC to 220 volts AC. Various types are available supplying from 10 to 35 watts per square inch and temperatures to 500°F.

(Electrofilm Heaters are a development of Electrofilm, Inc., P. O. Box 106, North Hollywood, Calif.)
Circle 9110 opposite covers.

For more information on items reported in the New Developments section circle corresponding numbers on reader service card opposite covers.

Dust collection bags install easily, give long life

Three section dust collecting bags, now standard equipment in manufacturer's filters, are designed for simplicity, long life. Manufacturer's tests show lives up to three times normal.

Two lengthwise seams divide the bag into three equal pockets. This simplified design reduces erection time and provides for easy inspection.

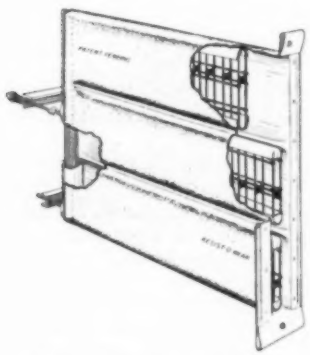
Two rubber coated inner spacers are inserted in each section. Spacer weight is distributed on three seams for minimum strain.

No outer spacers between bags are needed with this scheme. This eliminates abrasion at these points as well as simplifying construction.

Protector flap at dust chamber end of the bag provides extra reinforcement at that point. This is especially important to stop abrasion by

incoming dust in operation.

Each bag has a net effective cloth area of 22 sq ft. Filler cloth is of cotton sateen with



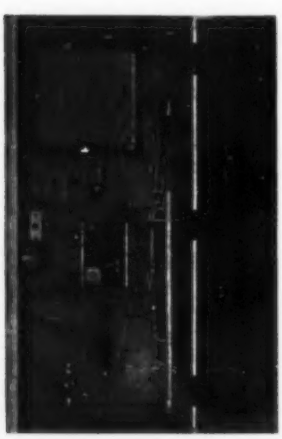
Cutaway drawing shows construction of dust collection bag

104 x 68 thread count per square inch.

(Resist-O-Wear dust collection bags are products of The W. W. Sly Manufacturing Co., Cleveland 1, Ohio.)
Circle 9111 opposite covers.

Dissolved O_2 analyzer catches one ppb

Dissolved oxygen analyzer which automatically and continuously measures dissolved oxygen in high-purity water,



By-pass flow system ensures fresh sample continuously

detects minute traces as low as one part per billion. Tests have proved instrument superior in accuracy, convenience and speed to conventional laboratory methods.

Design is based on a rapid and irreversible chemical reaction specific for dissolved oxygen. Operates on 115 volts, 50/60 cps.

Ranges include 0 to 25, 0 to 50, 0 to 250 parts per billion plus a ten-fold extended range with the upper portion of the scale compressed for leak tracing during boiler start up.

Accessories include a multi-sample system for monitoring up to four streams with one instrument; a calibrator for precise, direct instrument calibration; and temperature and pressure regulators.

(Model 70 Dissolved Oxygen Analyzer is a product of Beckman Process Instruments Division, Fullerton, Calif.)
Circle 9112 opposite covers.

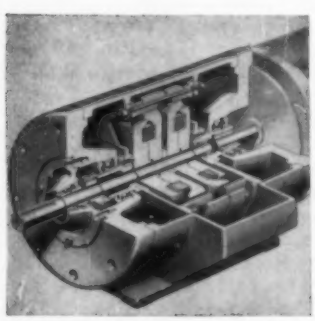
Variable speed drive doubles as clutch

Variable speed drive is powered by constant speed motor and designed around eddy-current coupling. Four models can be used as:

- controlled-slip coupling
- variable speed gear motor
- variable speed motor
- integrally mounted speed reducer.

Six sizes of these drives accommodate motors up to 150 hp at 1750 rpm. Maximum torque transmitted is 450 foot pounds. No DC supplies are required.

Since coupling between motor and load is a magnetic field, mechanical shocks are absorbed. No mechanical clutch is needed. Motor can be started and brought up to speed unloaded.



Cutaway shows arrangement of rotating armature and field components

Slip between driven and driving members is necessary for torque transmittal. This unit delivers rated torque at a minimum slip of about 5% — efficiency is 94-95%.

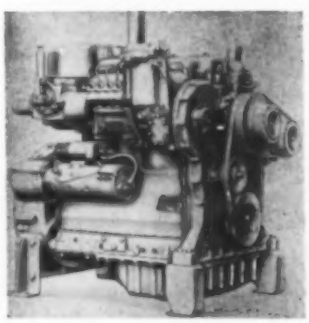
Direct current for control is low wattage and can be provided with dry rectifier from regular AC line.

(Marvex variable speed drive is a development of Cone-Drive Gears Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.)
Circle 9113 opposite covers.

Four-cylinder diesel develops 75 hp

Developing 75 horsepower at 2400 rpm, this 252 cubic-inch motor has four cylinders with a four-inch bore, five-inch stroke. It is a four-cycle naturally aspirated valve-in-head motor.

At 2000 rpm, it will deliver 50 hp continuously, handle



Available accessories include 30 kw generator

peaks of 68 hp. It can be supplied with a generator rating 30 kw continuous.

Air or electric automatic starting is available. For all-weather starting, gasoline starting is available. Complete line of attachments and accessories includes radiators, heat exchangers, clutches, torque converters, etc.

(D 311 (Series H) diesel engine is a development of Caterpillar Tractor Co., Engine Division, 600 W. Washington, East Peoria, Ill.)
Circle 9114 opposite covers.

X MARKS THE CRITICAL SPOTS!

It takes more than muscles to build a storage bin

Before the physical work of building a bin begins, we must know the problems involved at the *Three Critical Points.*

X What is the loading problem?
X What are the characteristics of the material to be stored . . . and its "flowability"?
X What is the volume and rate of discharge?

When planning your next storage bin, may we sit in on the very early stages of planning?

NEFF & FRY COMPANY
310 Elm St., Camden, Ohio

N&F — *You can always spot a Neff & Fry Bin by the shape of the stave!*

Circle 9115 opposite covers.

NEW LITERATURE

plant services — power services maintenance

Reviews of books and industrial bulletins describing equipment, supplies, services

How your counterparts view maintenance

"Techniques of Plant Maintenance and Engineering" is a compilation of 35 papers and several discussions about plant maintenance. These are taken from meetings at the Plant Maintenance Conference.

While the book is in no sense a "handy man's guide," it does touch a wide spectrum of maintenance and engineering problems. And it shows promise of real help for planners and top people in maintenance.

Typical topics: how to organize and manage a maintenance program, labor relations, the problem of the small plant, getting work cooperation from employees.

At the same time, this is not a compilation of lofty thinking. It is not written in a vacuum. Accidents, near misses, inspection techniques, pet remedies for common problems and similar practical material abounds in the discussion sections.

("Techniques of Plant Maintenance and Engineering," 211 pages 8½ x 11", illustrated, costs $10. It is published by Clapp & Poliak, Inc., Dept. PI, 341 Madison Ave., New York 17, N.Y.)

Describes installations of bent-tube boilers

Twenty-two page bulletin contains numerous photographs and drawings to describe various industrial installations of line of bent tube boilers.

Descriptions cover two classes of boilers.

(Bul VF-VS 2 is issued by Henry Vogt Machine Co., 10th & Ormsby Sts., Louisville 10, Kentucky.
Circle 9123 opposite covers.

DC high potential tester —15 models are shown

Four-page bulletin details full specifications and application data of some 15 DC high potential tester models covering output ranges of 5, 10, 20 and 30 kv DC.

Instruments are used in design, production and maintenance testing of cables, motors, capacitors and insulation samples.

(Bul 5-1.2 is available from Associated Research, Inc., Dept. PI, 3777 W. Belmont Ave., Chicago 18, Ill.)
Circle 9124 opposite covers.

Shows forged valve

Two-page circular shows a forged steel gate valve for screwed or welded connection. Sizes range from ½ through 2 inches in a design rated at 800 psi at 850°F or 2000 psi at 100°F.

(Circular 607 is issued by Lunkenheimer Co., Dept. PI, Box 360, Cincinnati 14, Ohio.)
Circle 9125 opposite covers.

Describes high frequency motor generator

Six-page bulletin graphically describes features of recently-introduced line of vertical, water-cooled, inductor motor-generator sets for induction heating and melting.

Bulletin contains supplement showing electrical characteristics of all units. These include ratings from 175 to 300 kw at 1000 cycles, 15 to 300 kw at 3000 cycles, 20 to 100 kw at 4200 cycles, and 15 to 250 kw at 10,000 cycles.

(Bul SK-4897 is issued by Electrical Division, Safety Industries, Inc., Dept. PI, PO Box 904, New Haven, Conn.)
Circle 9126 opposite covers.

Explains DC supplies

Two-page data sheet gives information and specifications on line of transistorized, low-voltage, high-current, DC supplies. Units have outputs of 6, 12 or 28 v at 15 or 30 watts.

(Q-Nobatron Data Sheet is available from Sorensen & Co., Inc., Richards Ave., South Norwalk, Conn.)
Circle 9127 opposite covers.

Presents compact design for rotary blowers

Compact design for rotary positive blowers, which results in reduced floor space, is presented in four-page bulletin.

Blowers feature a vertical arrangement of the impellers to provide horizontal inlet and discharge connections.

Units are available in 36 sizes covering capacities from 2000 to 14,000 cfm at pressures up to 6 psig and from 1500 to 8000 cfm at pressures to 10 psig.

(Bul RAS-158 is available from Roots-Connersville Blower, a Division of Dresser Industries, Inc., Dept. PI, 900 West Mount St., Connersville, Ind.)
Circle 9128 opposite covers.

Indicates oxygen on the spot

Four-page bulletin photographically illustrates construction and use of a portable oxygen meter. Principal uses are listed as dealing with corrosive atmospheres, checking purging of pneumatic or transmission piping, process systems.

(Bul 0817-1 is issued by Mine Safety Appliances Company, 201 N. Braddock St., Pittsburgh 8, Pa.)
Circle 9129 opposite covers.

Lists consulting firms and their specialists

Now available, a second edition of "Engineering Consultants" lists about 250 specialists and 100 consulting firms. Each individual listing shows specialties, educational background, memberships. Current addresses are furnished.

Company listings somewhat similar. Principal members of the firm are listed, and specialties detailed.

(To obtain a hard-bound copy of "Engineering Consultants," 136 pages, remit $2.50 ($1.50 for paper-bound) direct to American Institute of Consulting Engineers, Dept. PI, Suite 401, Engineering Societies Bldg., 33 W. 39th St., New York 18, N.Y.)

Gives all the facts behind water treatment

Designed for study as well as reference, 258-page water handbook is thorough but easy to understand. This fifth edition does not require specialized foreknowledge.

Three principal types of information are contained. Early chapters deal with basic treatment processes — aeration, coagulation, softening and others. Then specific water problems are explained. Finally, detailed descriptions show how various equipment is put to work.

In addition there is a section on basic water analysis.

Extremely well illustrated, the book abounds with charts, tables, diagrams, photos and photomicrographs.

(To obtain "Handbook of Industrial Water Conditioning," 258 8½ x 11" pages, remit $3.00 direct to Betz Laboratories, Inc., Dept. PI, Gillingham and Worth Sts., Philadelphia 24, Pa.)

Complete index to boiler line

Attractively printed in four colors, ten-page catalog displays package water tube boilers for low pressure steam and hot water. One page uses color coded symbols to completely index boiler line by size, function, available accessory equipment.

Full-color cutaways supplement shop photos and engineering drawing to show construction details and features. Controls are also described.

("Package Boilers" is issued by Rite Engineering Co., Dept. PI, 9441 Washburn Crossing Road, Downey, Calif.)
Circle 9116 opposite covers.

Presents motorized and magnetic valves

Twenty-four page catalog illustrates and lists specifications on magnetic and motorized valves for air, water, gas, steam, oil, and refrigerants.

Solenoid coil rating tables are included. Another feature is two flow charts — one for liquid, the other for compressible fluids.

(Cat V-58 is issued by The Mercoid Corporation, 4201 Belmont Ave., Chicago 41, Ill.)
Circle 9117 opposite covers.

Introduces water-reducible insulating varnish

Water-reducible insulating varnish which will neither burn nor support combustion is introduced in four-page brochure.

Ordinary tap water is used to thin the new varnish, and repeated tests have demonstrated that any commonly available water may be used as a thinner.

Despite the fact that water is used, the emulsion insulating varnish does not absorb any more moisture from the air than do solvent varnishes.

(Bro IN-204 is available from General Industrial Division, Sherwin-Williams Co., Dept. PI, Cleveland 1, Ohio.)
Circle 9118 opposite covers.

Big V-block engines

Pictures and descriptions of 12- and 16-cylinder, four-cycle, V-block engines are contained in this 18-page bulletin. Diesel, spark-ignition gas, and dual fuel engines are shown installed. Cutaways and drawings show details of construction.

(Bul 262 is available from Nordberg Mfg. Company, Milwaukee 1, Wis.)
Circle 9119 opposite covers.

Describes air hoist

Fold-out bulletin of six pages describes and pictures line of air operated hoists.

Dimensions and specifications are given on line of ¼, ½ and 1 ton capacity, link and roller chain types.

(Bul 15010-24-58 is issued by Manning, Maxwell & Moore, Inc., Shaw-Box Crane & Hoist Div., Muskegon, Mich.)
Circle 9120 opposite covers.

The story of — 'ceiling specialists'

Detail drawings and use photos show six types of luminous ceilings. These illustrations are contained in an eight-page bulletin which also describes and specifies the ceiling components and their use.

While all provide continuous diffused light surfaces, each has special features which adapt it to specific problems. One, for example, is also an acoustical ceiling.

("The Ceiling Specialists" is issued by Luminous Ceilings Inc., Dept. PI, 2500 W. North Ave., Chicago 47, Ill.)
Circle 9121 opposite covers.

For more information on items reported in the New Literature section circle corresponding numbers on reader service card opposite inside covers.

NOW···GLOBE OFFERS···
two new INTERCHANGEABLE trays for support of cables, wiring and tubing

★ Engineered for uniform design and easy installation
★ Steel or aluminum construction
★ Complete accessories for SPEEDIER Installation
★ No sharp edges to damage cables
★ Complete interchangeability

Now, for the first time, two types of cable trays, one a ladder type and the other a basket type, are available to be used INTERCHANGEABLY at any given location, depending on the type and weight of the cables to be suspended. The advantages of each type tray can thus be used to the fullest extent. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is intended for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants, in modernization, and for power distribution in all types of manufacturing processes. A new catalog, just off the press, gives full information and installation techniques. Ask for your FREE copy today.

Distributors are to be found in all principal cities— consult the yellow pages in your phone book under "Gratings" or "Conduits" for the one nearest you.

109

PRODUCTS DIVISION

The **GLOBE** *Company* MANUFACTURERS SINCE 1914

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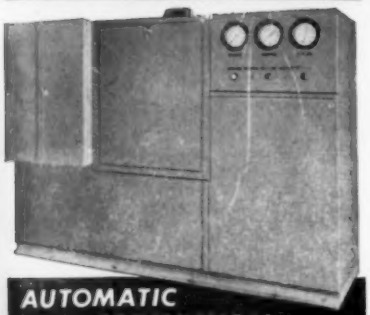
Circle 9122 opposite covers.

NOW-Steam Atomizing
WITH
NATIONAL AIROIL
Packaged Firing Units
FOR OIL AND/OR GAS FUELS



AUTOMATIC
ECONOMICAL
CLEAN . . . SAFE

● Fully Automatic ● Low Fire Start ● Electric-gas Ignition ● Modulating Fire Control ● Damper Sequence Control ● Forced Draft Combustion Air ● Electronic Combustion Safety Supervision ● Mechanical Atomizing—Steam assisted internal mixing oil burner ● Ring or Cylindrical type Gas Burner for gas fuel ● Fire tested before shipment.

NOW . . . with the new Series 20 Packaged Firing Unit you can have all the advantages of the outstanding Dual Stage burner in a completely packaged unit equipped with the latest in electronic safety controls to give *automatic* start, *automatic* modulation, *automatic* shutdown.

Series 20 Packaged Firing Units are factory fire tested, ready for immediate and low cost installation in your furnace room. They need only oil, gas, steam, draft and electrical connections—everything else needed for fully automatic burner operation is there.

Capacities of standard units range from 200 to 830 boiler horsepower. (7,200 to 30,000 pounds of steam per hour). Larger units are available on order to meet your special needs.

Units may be used with any standard boiler or furnace under natural or induced draft, or with pressurized boilers —in which case the unit provides sufficient forced draft to overcome draft loss through boiler. Where a high chimney or induced draft fan is used, an automatic damper motor is furnished to provide a constant furnace draft during operations; and a reduced or zero draft during shutdowns.

Preventative Maintenance consists chiefly of keeping the burner gun clean, with periodic inspection and cleaning of strainers and safety devices. This minimum maintenance will give your engineer or fireman extra time to attend to blow-down, soot-blowing, or to check operations and efficiency of plant and auxiliary equipment.

For complete details, specifications, illustrations, and dimensions write today for Bulletin No. 28.

When used in conjunction with a National Airoil Fuel Oil Pumping and Heating Unit (Bulletin No. 40) a most reliable combination results.

NATIONAL AIROIL BURNER COMPANY, INC.

1350 E. Sedgley Ave., Philadelphia 34, Pa.
S. W. Division: 2512 So. Blvd., Houston 6, Texas

Circle 9130 opposite covers.

Presents S-valves for tough jobs

Four-page bulletin describes, in full, line of S-valves (right angle valves) for tough service where conventional valves have proved unsatisfactory.

Cut-away drawing explains valve's operation and features. Two types of actuators are described.

(Bul S-1 is issued by Conoflow Corporation, 2100 Arch Street, Philadelphia 3, Pa.)
Circle 9131 opposite covers.

Fault control story

Complete story of fault control in electric circuits is illustratively told in 28-page bulletin.

Fault control principles and applications are fully discussed.

(Bul FC-1 is available from BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Box 177, Detroit 32, Mich.)
Circle 9132 opposite covers.

The worm gear story

Information on worm gearing in general, advantages of this type of gearing, and pertinent design and manufacturing facts are given in eight-page, illustrated booklet.

Numerous photographs of applications are included.

(Bul 150 is available from Cleveland Worm & Gear Co., Dept. PI, 3249 East 80th St., Cleveland 4, Ohio.)
Circle 9133 opposite covers.

All about roller chain from every angle

In its 154 pages, this paper-bound book delves into just about every facet of using and designing for roller chains and sprockets. It gives requirements for a wide variety of uses.

Far more than a catalog of types, the book looks at practice and theory of selection, installation, lubrication and maintenance. For instances where corrosion is a factor, a guide table shows typical choices for 400 conditions.

(Book 2657 is issued by Link-Belt Company, Dept. PI, Prudential Plaza, Chicago 1, Ill.)
Circle 9134 opposite covers.

Details line of pumps

Internal gear pumps, sliding vane pumps, spur external gear pumps, and fluid motors are described in detail in 12-page catalog.

Included is a complete pump guide selection chart that classifies all models as to operating requirements, construction features, mountings, packing characteristics and the services for which applied.

(Cat 100 is issued by Tuthill Pump Company, Dept. PR, 951 East 95th St., Chicago 19, Ill.)
Circle 9135 opposite covers.

Lists rubberized abrasives

Eight-page catalog lists and explains uses of rubberized abrasive wheels, points, blocks, sticks and cones.

Operating instructions, application information, tables, illustrations, and technical data are included.

(Rubberized Abrasives Cat is issued by Cratex Manufacturing Co., Dept. PI, 1600 Rollins Road, Burlingame, Calif.)
Circle 9136 opposite covers.

"I've been through your plant . . . It's going to make a dandy case study."

Specifies synthetic belt for pulley drives

Six-page foldout bulletin holds complete specification information for synthetic belting. Description and sample are followed by tabular ratings of hp per inch of pulley width for various grades of belt and transmission conditions.

Correction factors and specific properties of the material are also set forth in detail.

("Texalon" is issued by J. E. Rhoads & Sons, Wilmington 99, Delaware.)
Circle 9137 opposite covers.

How to select and use automatic transfer switch

How to select an automatic transfer switch and applications of this equipment are covered in 24-page booklet.

Publication discusses such requirements as inrush capacity, continuous duty rating, rapid transferral of load, high thermal capacity and ability to withstand electromagnetic effects.

Installation descriptions are included.

(Publication 596R1 is issued by Automatic Switch Co., Florham Park, N.J.)
Circle 9138 opposite covers.

Supplements data on speed reducers

Complete data on horsepower ratings, dimensions, mounting information and construction principles of double-, triple-, and quadruple-reduction gear drives are presented in six-page folder.

Folder is supplement to manufacturer's Book 2651 and describes recently developed quadruple-reduction gear drives along with two recently introduced sizes of double-reduction and three additional sizes of triple-reduction helical gear drives.

(Folder 2651A is issued by Link-Belt Company, Dept. PI, Prudential Plaza, Chicago 1, Ill.)
Circle 9139 opposite covers.

Drive out

FOUL AIR

Blow in

FRESH AIR

with Coppus Type A Ventilator

Assure greater safety, comfort for workers... get greater efficiency.

Drive out dangerous fumes, gases, stagnant or hot air from boilers, cable manholes, tanks, vats and other confined places. *Supply fresh air continuously.*

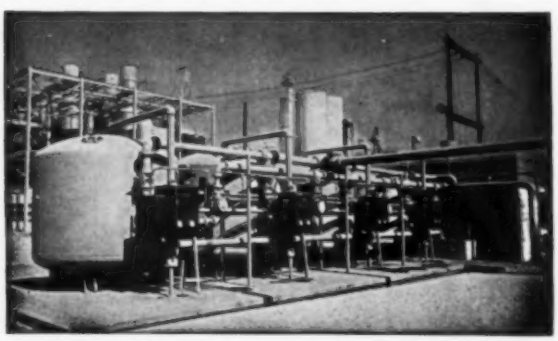
Send now for further information. Coppus Engineering Corporation, 190 Park Avenue, Worcester 2, Mass.

MANHOLES made safe for workers' entrance within minutes.

BOILER AND TANK INTERIORS cooled by Coppus. Fresh air supplied continuously.

ANOTHER **COPPUS** "BLUE RIBBON" PRODUCT

Circle 9140 opposite covers.



BOILER FEEDWATER TREATMENT

(for over half a century)

Complete plants for water softening, demineralization, silica removal, de-oiling of condensate, clarification, de-alkalizing and all other requirements.

Send for Bulletin BFT-11 or Nearest Field Representative.

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CLAYTON 1, N. J.

Circle 9141 opposite covers.

CUT HERE AND FILE

POWER PLANT & POWER SERVICES INDUSTRY

nomograph 10

Pressure Drops for Steam through Valves and Fittings

D. S. DAVIS
Head, Dept. of Pulp and Paper Technology
University of Alabama

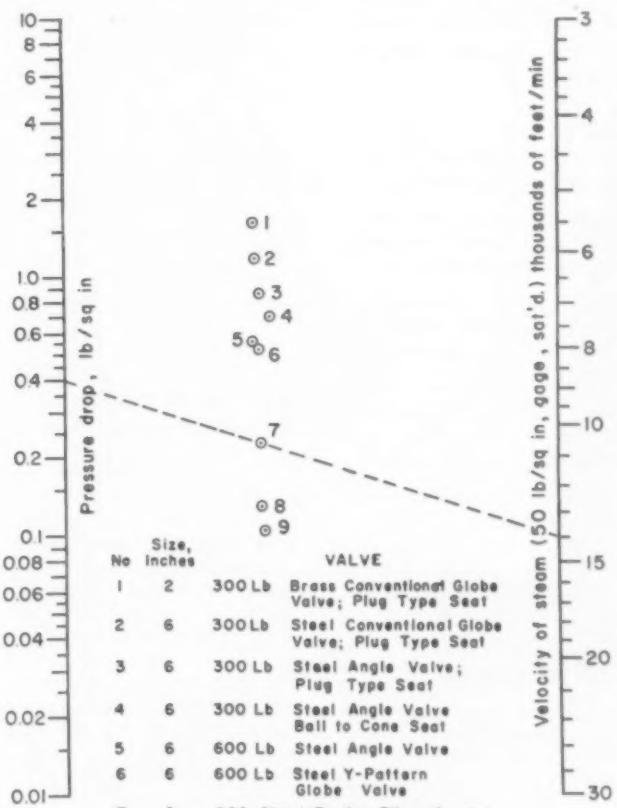
When saturated steam (50 psig) flows through valves and fittings, one can estimate pressure drops by use of accompanying nomograph, which is based on reliable data[1] and was constructed through well-known methods[2].

Broken index line shows that when steam (50 psig) flows through 6-in line, 250-lb cast iron, flanged, conventional 90° elbow at rate of 14,000 fpm, a pressure drop of 0.4 psi should be expected.

LITERATURE CITED

1) "Flow of Fluids through Valves, Fittings, and Pipe," pp 2-5, Tech Paper #410, Crane Co., Chicago, 1957

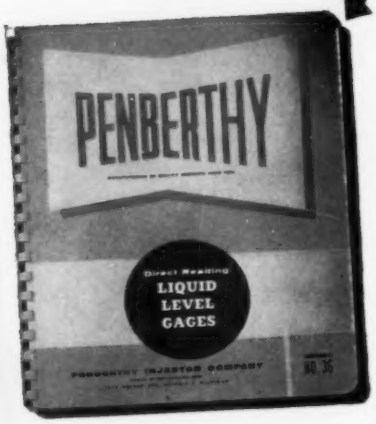
2) DAVIS, D. S., "Nomographs and Empirical Equations," Chap 10, Reinhold Publishing Co., New York, 1955



No	Size, Inches	VALVE
1	2	300 Lb Brass Conventional Globe Valve; Plug Type Seat
2	6	300 Lb Steel Conventional Globe Valve; Plug Type Seat
3	6	300 Lb Steel Angle Valve; Plug Type Seat
4	6	300 Lb Steel Angle Valve Ball to Cone Seat
5	6	600 Lb Steel Angle Valve
6	6	600 Lb Steel Y-Pattern Globe Valve
7	2	90° Short Radius Elbow for use with Schedule 40 Pipe
7	6	250 Lb Cast Iron Flanged Conventional 90° Elbow
8	6	600 Lb Steel Gate Valve
9	6	125 Lb Cast Iron Gate Valve
9	6	150 Lb Steel Gate Valve

Courtesy of Chemical Processing

GET THIS HANDY GUIDE TO BETTER VALVES AND GAGES



Shows complete line of Penberthy valves and liquid-level gages for power, petroleum, and process industries. Includes technical data, parts, price lists, and accessories such as:

HEATING AND COOLING GAGES... for accurate readings where liquids must be cooled or heated to obtain exact measurement.

INSTRUMENT VALVE... permits gage repair or replacement without shutdowns. Back-seating stem permits repacking under pressure.

FROST PREVENTIVE GAGE... eliminates frost build-up... assures dependable visibility. For industries where frosting interferes with accurate readings.

ILLUMINATORS... plastic wedge distributes bright, even light along entire column. Nonglaring... dustproof for perfect illumination.

WELDING PAD GAGES... where process conditions require observation windows as integral part of vessel.

PENBERTHY

Dept. PI

Penberthy Manufacturing Company
Division of Buffalo-Eclipse Corporation
1242 Holden Ave., Detroit 2, Mich.
Please send FREE copy of Catalog #36.

NAME_____ TITLE_____

ADDRESS_____

COMPANY_____

Circle 9142 opposite covers.

NEW LITERATURE

Water control-valves outlined

Nine different automatic water control-valves and their uses are described in eight-page bulletin.

Line includes cushioned check valves, water level control valves, sensitive pressure regulators and one-man control valves.

Sizes range from 2 to 36", for pressures up to 250 psi.

(Bul G-5A is available from Golden-Anderson Valve Specialty Company, 1217 Ridge Avenue, Pittsburgh 33, Pa.)
Circle 9143 opposite covers.

Gives data on material for cleaning iron

Detailed technical literature on chemical material for simultaneously cleaning and light phosphating iron, steel or zinc is given in two bulletins. Operation is carried on in three simple stages.

Bulletins of two pages each cover separately spray washer and dip tank operations.

(Buls 108-12 and 108-13 are issued by Turco Products, Inc., 6135 South Central Ave., Los Angeles 1, Calif.)
Circle 9144 opposite covers.

Quick guide to buying dry type transformer

Twenty-page bulletin is a quick and easy-to-use guide for specifying and ordering manufacturer's complete line of dry-type transformers.

Popular ratings and sizes for 60-cycle, indoor and/or outdoor, single- and three-phase applications are included in the illustrated publication.

(Bul GEC-1600 is issued by General Electric Co., Schenectady 5, N.Y.)
Circle 9145 opposite covers.

All about circuit breakers

Well-illustrated 56-page circuit breaker catalog shows and describes four types of breakers: molded case, low voltage power, switchgear and substation, and high voltage devices.

All information, including price, is located on the page with the description of the equipment. There is no need for the usual cross referencing.

(Catalog for July 1958 is issued by I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Pa.)
Circle 9146 opposite covers.

All about tachometers

Twenty pages of photographs and tables round out detailed information on line of tachometers.

Included are many photographs showing applications. Facsimile scales quickly show ranges available.

(Bul 35-20 is issued by James G. Biddle Co., Dept. PI, 1316 Arch St., Philadelphia 7, Pa.)
Circle 9147 opposite covers.

Conveyor belt idler story from lab to use

The story of a conveyor belt idler's development from laboratory to installation is presented in eight-page booklet.

Features outlined are diaphragm seal which keeps grease in, dirt out; and permanent factory lubrication.

Drawings, photographs and detailed exposition make the booklet a working manual.

(Bul 925 is issued by The Jeffrey Manufacturing Co., Columbus 16, Ohio.)
Circle 9148 opposite covers.

All about time switches

Twelve pages of pictures, drawings, tables and text describe three models of time switches.

Specifications, design features, dimensions, ordering instructions, applications, and pricing are included.

(Bulletin GEA-6681 is issued by General Electric Company, Dept. PI, One River Road, Schenectady 5, N. Y.)
Circle 9149 opposite covers.

Tells how to protect outdoor stockpiles

Four-page bulletin gives information on outdoor storage pile protection with a water-base spray.

Included are pictures and description of the surface crust produced, and a description of protection the compound provides.

Nine typical stockpile materials, including coal, and the recommended compound grades of protective compound are listed.

(Bul P58-1 is available from the Johnson-March Corp., Dept. PI, 1724 Chestnut St., Philadelphia 3, Pa.)
Circle 9150 opposite covers.

Multiple V belt? Or flat belt?

Theory and use of a drive using a flat single belt with multiple vee's is explained in eight-page bulletin. Charts and explanations show how such a belt achieves twice the contact area and half the face pressure of conventional belts.

Several other performance advantages are explained and summarized.

(Bul 6638C is issued by Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N. J.)
Circle 9151 opposite covers.

Features feedwater regulator

Two-element, air-operated feedwater control, which is responsive to both drum level and steam flow, is explained in four-page bulletin.

Complete mechanical description of components and schematic diagram showing suggested piping arrangement are included.

Table of specifications lists design features, materials of construction and application pressures.

(Bul 1055 is issued by Copes-Vulcan Div., Blaw-Knox Co., Dept. PI, Erie 4, Pa.)
Circle 9152 opposite covers.

APPLICATIONS UNLIMITED!

Equipto Angle

LEADS in versatility, Thousands of uses.

LEADS in finish with HOT DIPPED galvanized finish. Can't rust.

LEADS in strength.

LEADS in interchangeability with other makes.

LEADS in availability from ample stocks.

LEADS in know-how . . . over 50 years in equipment business.

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Equipto
Slotted Angle Division
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Manufacturer of World's Finest Steel Shelving - Slotted Angle - Bins - Drawer Units - Lockers - Carts - Benches.

Circle 9153 opposite covers.

for LOUDER SIGNALS

Any automatic process requires dependable signals.

The more extensive the process and the more personnel involved, the more important it becomes that these signals be seen or heard.

For that louder or brighter signal, FEDERAL manufactures a complete line of heavy duty bells, electric horns, air horns, sirens and Beacon Ray lights. These same signals can provide other services such as start and dismissal, paging or warning.

There are a number of places in your organization where the proper signal can save you time, money and even lives. Write for our Catalog No. 100 today.

FEDERAL SIGN and SIGNAL Corporation

8709 S. State St., Chicago 19, Ill.

Circle 9154 opposite covers.

CUT HERE AND FILE

POWER PLANT & POWER SERVICES INDUSTRY

nomograph No. 11

Pressure Drops for Water through Valves

D. S. DAVIS
Head, Dept. of Pulp and Paper Technology
University of Alabama

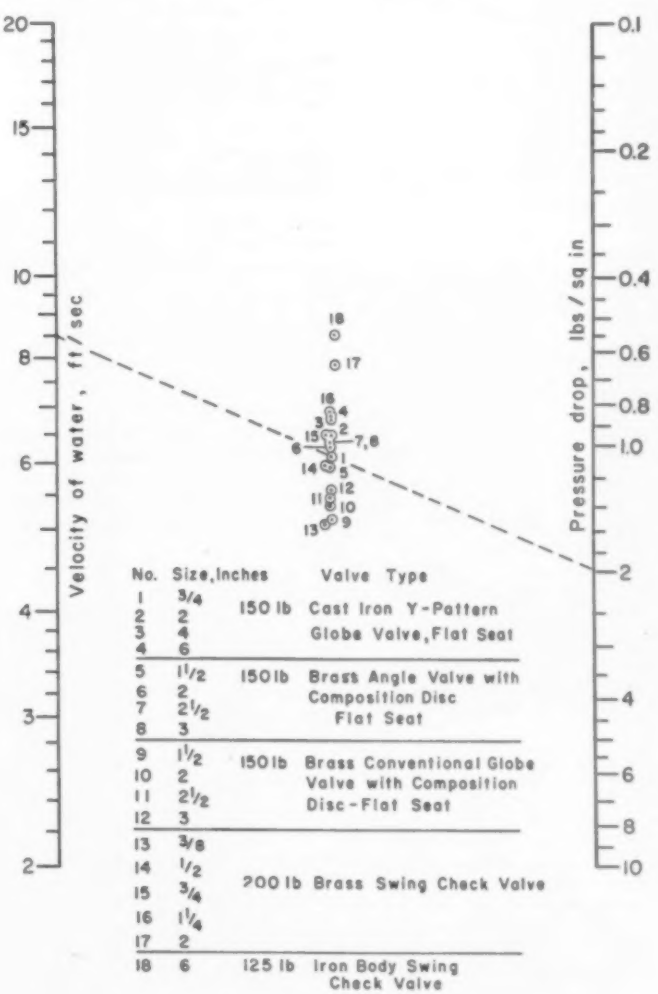
This nomograph, based on reliable data[1] and constructed by means of well-known methods[2], enables one to estimate pressure drops when water flows through various size and type valves.

Broken index line shows that one should expect a pressure drop of 2 psi when water flows through a ¾-in, 150-lb cast iron Y-pattern globe valve with a flat seat at a rate of 8.5 ft/sec.

LITERATURE CITED

1) "Flow of Fluids through Valves, Fittings, and Pipe," pp 2-4, Tech paper #410, Crane Co., Chicago, 1957

2) DAVIS, D. S., "Nomographs and Empirical Equations," Chap 10, Reinhold Publishing Co., New York, 1955



No.	Size, Inches	Valve Type
1	¾	150 lb Cast Iron Y-Pattern Globe Valve, Flat Seat
2	2	
3	4	
4	6	
5	1½	150 lb Brass Angle Valve with Composition Disc Flat Seat
6	2	
7	2½	
8	3	
9	1½	150 lb Brass Conventional Globe Valve with Composition Disc - Flat Seat
10	2	
11	2½	
12	3	
13	⅜	200 lb Brass Swing Check Valve
14	½	
15	¾	
16	1¼	
17	2	
18	6	125 lb Iron Body Swing Check Valve

Courtesy of Chemical Processing

Have you changed your address recently?

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Present Company .....

Main Product .....

Rating of Company .....

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City ..... Zone No. ..... State .....

NEW LITERATURE

Roller chain drives

Illustrated eight-page catalog gives complete descriptive information and tabular data on line of roller chain drives.

Items in line include bushed type and plate sprockets, interchangeable bushings, bushings for large sprockets, and single and double strand roller chains.

(Cat D-58 is issued by Information Div., Maurey Manufacturing Corporation, Dept. PI, 2915 Wabash Ave., Chicago 16, Ill.)
Circle 9156 opposite covers.

Professional engineering — a "how to" book

An illustrated 270-page book recently published explores how to become a professional engineer. It is a real "how to" book. It tells all the whens, wheres, and hows of going about getting a license.

Early in the book author John Constance takes up the question of just what professional engineering is (and what it is not). After tracing the history of this movement he concentrates on how to attain it.

Requirements, experience, records, examinations and related aspects are covered in the balance of the book.

(To obtain "How to Become a Professional Engineer," remit $5.50 direct to McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 36, N. Y.)

Corrosion meter

Fold-out bulletin of six pages describes instrument for measuring corrosion.

Instrument gives readings directly in microinches. Specimen does not have to be removed. Operation is on battery or line power, readings are given in less than a minute.

("Corrosometer" Bul is issued by Crest Instrument Company, Santa Fe Springs, Calif.)
Circle 9157 opposite covers.

Six step conversion from manual valve

Six steps in converting a manual valve to automatic operation are covered in illustrated catalog supplement dealing with conversion kit.

It shows how — without any special tools — large valves can be converted without removing them from the line.

(Cat V-200 is issued by C. H. Wheeler Mfg. Co., 19th and Lehigh Ave., Philadelphia 32, Pennsylvania.)
Circle 9158 opposite covers.

Offers technical paper on high-temp tube alloy

Twelve-page reprint of technical paper entitled, "Croloy 15-15N — An Austenitic Heat Resistant Alloy for Severe Tubular Application at Elevated Temperatures," outlines many characteristics of the alloy. Numerous charts and microphotographs are included.

(Bul TR-555 is available from The Tubular Products Div., The Babcock & Wilcox Company, Beaver Falls, Pa.)
Circle 9159 opposite covers.

Wall chart gives tips on unit heating

Two-color wall chart designed to promote better unit heating includes maintenance tips and a performance check list.

Covered under maintenance tips are inspection routine, cleaning and lubrication of various types of motors, overload protection, cleaning of heating coils and casings, and safeguards against internal corrosion.

Performance check chart shows what to look for if a unit heater is not performing properly. Ten common performance troubles and their possible causes are given.

Wall chart is 21 × 24".

(Wall chart is available from Modine Manufacturing Co., Dept. PI, Racine, Wis.)
Circle 9160 opposite covers.

One leak leads to another unless the seam is protected

If the seam of a riveted HRT boiler continues to be exposed to the same conditions, leaks are bound to recur. So the first leak is a warning against repeated leaking and calking.

The trouble and expense can be avoided by insulating the seam with a National Boiler Protector. This has been proved in thousands of cases over the last 40 years.

The relative costs of insulation and repair are suggested by the adage, "An *ounce* of prevention is worth a *pound* of cure."

Ask for our interesting literature.

NATIONAL BOILER PROTECTOR CO.
928 Reibold Bldg., Dayton 2, Ohio

Circle 9161 opposite covers.

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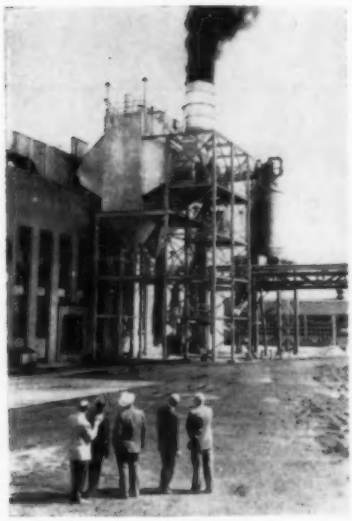
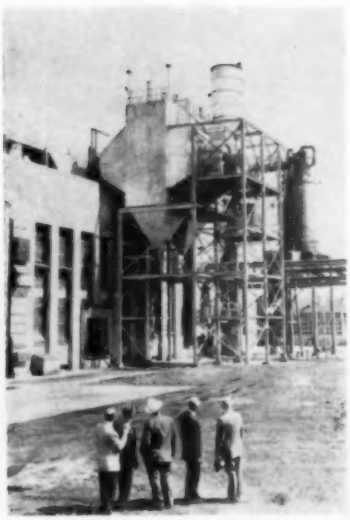
(inside front or back cover)

- for more information on articles in this issue
- to have POWER INDUSTRY sent to you regularly
- for more information on "New Developments" and "New Literature"

PHOTO NEWS

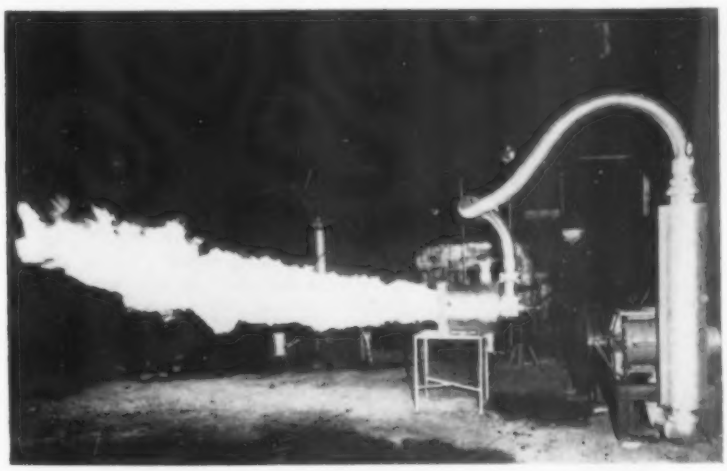




43 SECOND CLEAN UP! The difference between these two photos is 43 seconds and the turn of a switch on the electrostatic precipitator. North American Aviation's plant at Columbus, Ohio was equipped with the unit (between stack and building) designed and built by Metal Products Division of Koppers Company, Inc., Dept. PI, 200 Scott St., Baltimore 3, Md. Circle 9162 on Reader Service Card.

HIGHER FLAME TEMPERATURES WITH GAS AND OIL are being obtained with this pulsating burner. Unit uses 3-psig compressed air to atomize fuel metered into air stream. Flame produced is steady, consisting of extremely rapid series of explosions—much like the pulsating jet used to drive the German V-1 Buzz Bomb. Results are operations approaching perfect combustion, with peak temperatures of 3450°F when burning oil and above 3300°F with 1000 Btu/cu ft natural gas.

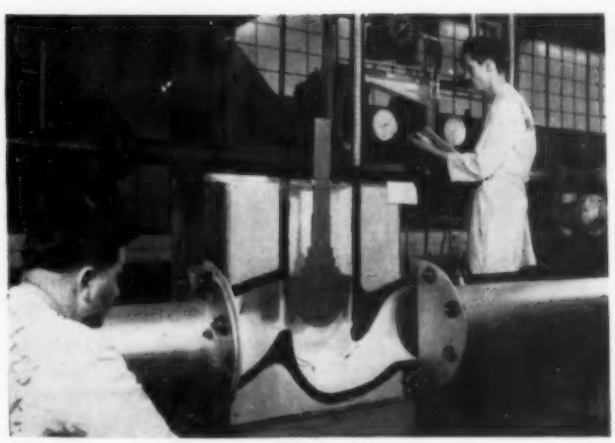
(Radiant Pulsation-Type Oil-Gas Burner is development of E. W. Bliss Company, Dept. PI, Canton, Ohio.)
Circle 9163 on Reader Service Card.



FIRE AND WEATHER RESISTANCE is being given to reinforced plastic structures through use of overlays of Dynel fabric. This synthetic fiber material has been put to work protecting radar spheres in the Arctic from sub-zero temperatures and winds up to 240 miles per hour. In addition, the fabric is used for the inside lining to increase fire resistant properties of the buildings.

IN AN ALL-OUT TEST to determine effectiveness of insulation as protection against moisture, open motors were submerged in water and allowed to run at full rpm. In this case, the motor has an epoxy-encapsulated stator, and its ability to perform is witnessed by the churned up bubbles. Tests show that insulation resistance is reduced very slightly after long periods of immersion, but not to the point of electrical breakdown.
(Open motor with epoxy-encapsulated stator is manufactured by Allis-Chalmers Manufacturing Co., Dept. PI, Milwaukee 1, Wis.)

Check 9164 on Reader Service Card.



BY BEING ABLE TO SEE HOW SHE FLOWS, technicians at Edward Valves, Inc., subsidiary of Rockwell Mfg. Co., can analyze flow characteristics and pressure drops when developing new valves. Colored threads and other visual aids reveal various flow phenomena in plastic half models of proposed valve designs.

Effective Condenser Operation

(*Continued from page* 19)

ligible quantity, if below the condensate level, will show up as high oxygen in the condensate.

For example, on a condenser condensing 500,000 lb/hr of steam, an air leak of only 0.006 cfm would represent 0.01 cc/liter of oxygen in pure condensate.

Leakages of these extremely small magnitudes are very difficult to detect other than by periodically checking the oxygen content of the condensate.

An air meter at the discharge of the air removal equipment is an absolute necessity in operating a condenser.

Stopping Slime

While air leakage affects condenser vacuum, the most common cause of reduced condenser performance is fouling of the tube surface by scale or slime.

Scale-forming water in a once-through system, as found on a condenser that obtains circulating water from a lake or river, is very hard to control. It may be necessary, therefore, to acid clean a condenser periodically to maintain a reasonable heat transfer rate.

Condensers using cooling towers as a source of circulating water are perhaps the hardest to control.

Slime consists of minute living organisms, colonies of which tend to trap and hold suspended solids from the water. Chlorine poisons these organisms, preventing their growth on the tubes. Chlorine requirements can best be established by experimentation.

Normally, a condenser can best be cleaned by the so-called slug treatment — a relatively high concentration of chlorine is fed over a relatively short period of time. This procedure should be repeated on a once per shift basis or as required.

When inspecting a condenser for slime, always be sure to inspect the outlet water box. It is not at all unusual to find the inlet water box completely free of slime while the back end is badly fouled.

This is because temperature rise through the system may cause much more vigorous slime growth.

A simple maintenance step that should never be overlooked is to immediately drain the condenser of all water at shutdown, and open the manhole doors on the condenser to allow it to dry out. Slime or algae cannot exist without moisture.

Therefore, when the condenser is allowed to dry out, these organisms die and form a powdery substance. When the circulating water flow is again started, this substance usually is washed out and a relatively clean tube remains.

There also have been instances where condensers were allowed to remain closed for some time during shutdown periods and where the decaying organisms actually caused tube failures due to ammonia attack.

On the steam side, deposits of boiler compound, rust, and the like are relatively uncommon but have been found in some instances. Erosion attack of condenser tubes by wet steam from the turbine wheels is more common.

It is very difficult to note small changes in performance unless sufficient data is taken on a daily basis to enable operators to note trends.

From an operating standpoint, it is not always necessary to work with absolute values. It is more important to be able to note trends. One of the simplest ways of noting these trends is by plotting data.

Although the main purpose of the condenser is to provide a vacuum and to return high-purity condensate to the system, high-temperature and high-pressure cycles have imposed additional problems on condenser designers.

To increase the efficiency of a modern electric utility plant, the greatest potential savings exist in the steam operation. A complete understanding of condenser function and a thorough grasp of operating conditions will keep the unit on the line and reduce maintenance and auxiliary power costs. ■

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THAT'S INTERESTING

Truck refuels locomotive

Trucks are servicing switching locomotives while they work. Diesel refueler was built by the Farrell Manufacturing Co.

It carries 1500 gallons of fuel oil. Sand tanks have a 70 cubic yard capacity. Sand is blown into the locomotive by air from the train's brake system. In addition the truck also carries: radiator water, compressor and lubrication oil, even ice for the crew's drinking water.

Automatic defrosting for piers

Heat exchanger has been developed to eliminate ice from around large pier installations by two engineers at Armour Research Foundation.

Using principles of heat exchange and the upsetting of stratification of water required for freezing, unit is inexpensive, portable, and foolproof in normal use.

Almost any pattern in the ice can be melted. Operation costs about $16 per year for a 70 lb unit. In tests, water temperature around pier maintained 35°F, even through coldest weather which reached −20°F.

At 35°F, unit was operating at only 38% efficiency, compensated for the freezing of about 30,000 lb of ice in 10 hours.

It glitters

Not a "solid gold cadillac" but a gold-plated computer marked the 100th model G-15 instrument that rolled off the Bendix Computer Div. assembly line. In computer production this is comparable to the one-millionth automobile pulled off an assembly line in Detroit. Recipient, Dow Chemical Co., will use it in new fiber development.

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Refinery Power Plant Compares Bonnet Joints

No maintenance for Crane Pressure-Seal valve on 10-year high-pressure/high-temperature service

Ten years ago two 10-inch, high-pressure-temperature gate valves were installed in the power plant of a Midwest refiner. Each one was installed on a boiler lead line, where steam service is 900° F. at 1280 psi.

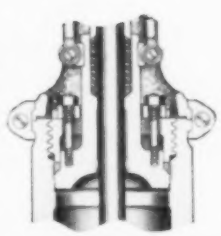
One valve is a conventional bolted bonnet type; the other, a Crane Pressure-Seal Bonnet Valve.

The bolted bonnet valve has required major maintenance four times in ten years because of bonnet joint leakage.

The Crane Pressure-Seal Bonnet Valve, during the same period, has never leaked . . . has needed no maintenance of any kind!

Conventional valves fight line pressure with heavy flanges and bolts at the bonnet joint. The bolting requires restressing and maintenance with each extreme change in temperature. Crane Pressure-Seal design harnesses line pressure to keep the bonnet joint tight despite extreme variations in temperature and pressure.

For complete information about Crane Pressure-Seal Bonnet Joint Valves—gates, globes, angles, stop-checks and swing-checks—in 600, 900, and 1500-pound classes—call your Crane Representative, or write to address below for new Circular AD-2336.



Here's the Crane Pressure-Seal Joint that eliminates bonnet joint leakage and maintenance on high-pressure-temperature services.

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